U.S. POLYMERIC

HITCO MATERIALS DIVISION

U.S. Polymeric

FM 5064J (KAISER) LOTS #1 (K) - #4 (K)

FINGERPRINT TEST DATA REPORT

NAS8-36298 COPY # 9

TABLE OF CONTENTS

FILLER TESTING

NAS8-36298

U.S. Polymeric D.E. 71108

Filler Lot for NASA Lot# 1

CHARTS

FILLER TESTING

NAS8-36298

U.S. POLYMERIC O.E. 71108

Filler Lot for NASA Lot# 1

1. Carbon Content, %
QAI-5560

SAMPLE	#1-1	#1-2	#1-3
	99.17	99.10	99.12
NASA LOT# 1 AVERAGE			99.13

2. Ash Content, %
PTM-71B

	.005	.000	.000
	.009	.014	.005
AVG.	.007	.007	.003
NASA LOT# 1 AVERAGE			.006

3. Atomic Absorption, ppm
CTM-53B
(Values are average of 2 determinations)

	#1-1	#1-2	#1-3	LOT#1 AVG.
Na	3.0	2.0	1.5	2.2
K	1.5	0.0	0.0	0.5
Ca	0.0	0.0	0.0	0.0
Mg	0.5	0.0	0.0	0.2
Li	0.0	0.0	0.0	0.0
TOTAL	5.0	2.0	1.5	2.8

3a. Moisture Content, %
CTM-53B

	.005	.010	.005
	.019	.005	.005
AVG.	.010	.008	.005
NASA LOT# 1 AVERAGE			.008

3b. Ash Content, %
CTM-53B

	0.000	0.000	0.000
	0.000	0.000	0.005
AVG.	0.000	0.000	0.003
NASA LOT# 1 AVERAGE			0.001

4. pH, Units
ASTM D1512

	4.85	4.85	4.95
	4.90	4.90	5.05
AVG.	4.88	4.88	5.00
NASA LOT# 1 AVERAGE			4.92

5. Particle Size, microns
S.E.M. procedure
(Average values are of 10 determinations)

AVG.	.45	.36	.38
Maximum	.65	.62	.85
Minimum	.22	.17	.22
Std. Dev	.08	.08	.08
NASA LOT# 1 AVERAGE SIZE			.40

6a. TGA, °C at 50% Loss
CTM-51

	750	751	749
NASA LOT# 1 AVERAGE			750

HITCO MATERIALS DIVISION
700 E. DYER ROAD, SANTA ANA, CALIFORNIA 92707 • (714) 549-1101 • TWX (910) 595-1130 • FAX # (714) 549-2858-5-2437

Filler Lot for NASA Lot# 1

6b. TGA
CTM-51

See Charts 6A-6C

7. Particle Size Distribution
CTM-72

See Charts 7A-7C

7a. Particle Size, microns
CTM-72

	#1-1	#1-2	#1-3
	.87	.88	.92
	.86	.95	.95
AVG.	.86	.92	.94

NASA LOT# 1 AVERAGE .91

U.S. Polymeric

Hamid M. Quraishi

Hamid M. Quraishi, Manager
Quality Assurance Department

Sample: 1-1
Size: 8.84 mg
Run No: MIR #12830 (13)
Date: JAN/31/86 12:59

TGA

OMNITHERM DATA SYSTEM
BECKMAN INDUSTRIAL

Operator: M. WEGENER
Disk ID: DATA DISK #93
File No: D 35.DAT V2.1
Plotted: FEB/04/86 07:23

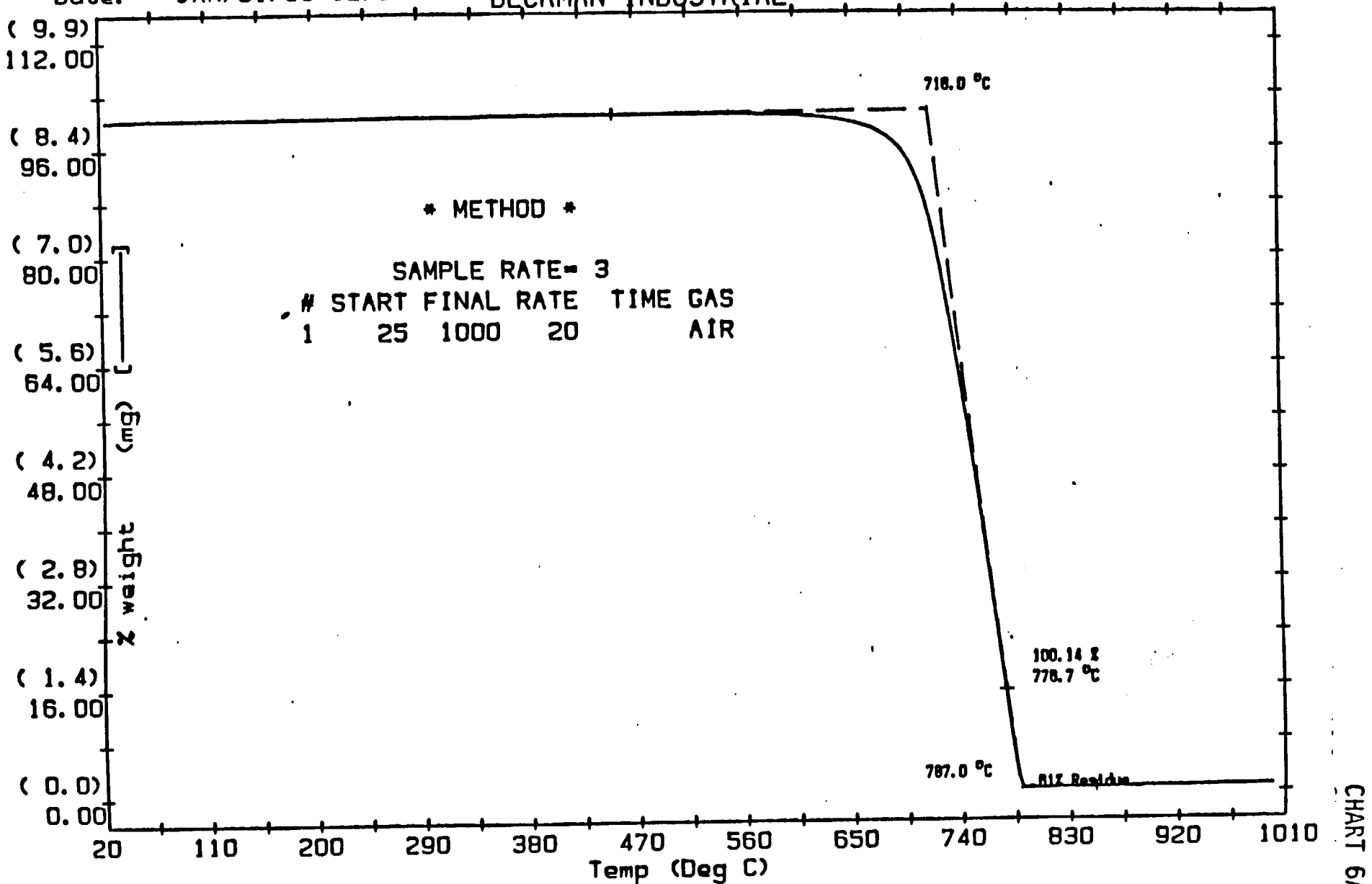


CHART 6A

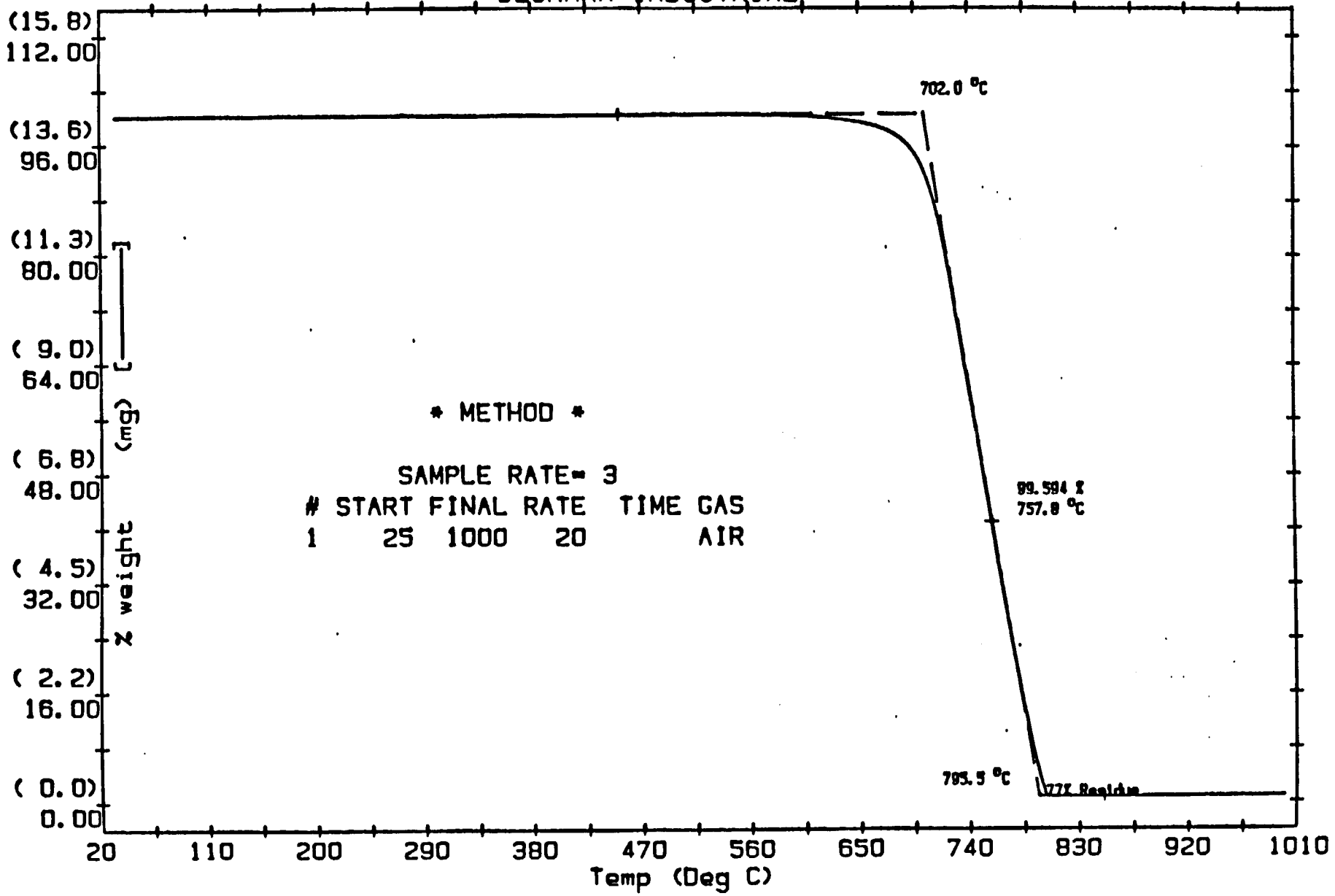
Beckman Industrial™ ANALYTICAL LABORATORY SERVICES

Sample: 1-c
Size: 14.192 mg
Run No: MIR #12830 (13)
Date: FEB/03/86 07:13

TGA

OMNITHERM DATA SYSTEM
BECKMAN INDUSTRIAL

Operator: M. WEGENER
Disk ID: DATA DISK #93
File No: D 36.DAT V2.1
Plotted: FEB/04/86 07:27



Beckman Industrial™ ANALYTICAL LABORATORY SERVICES

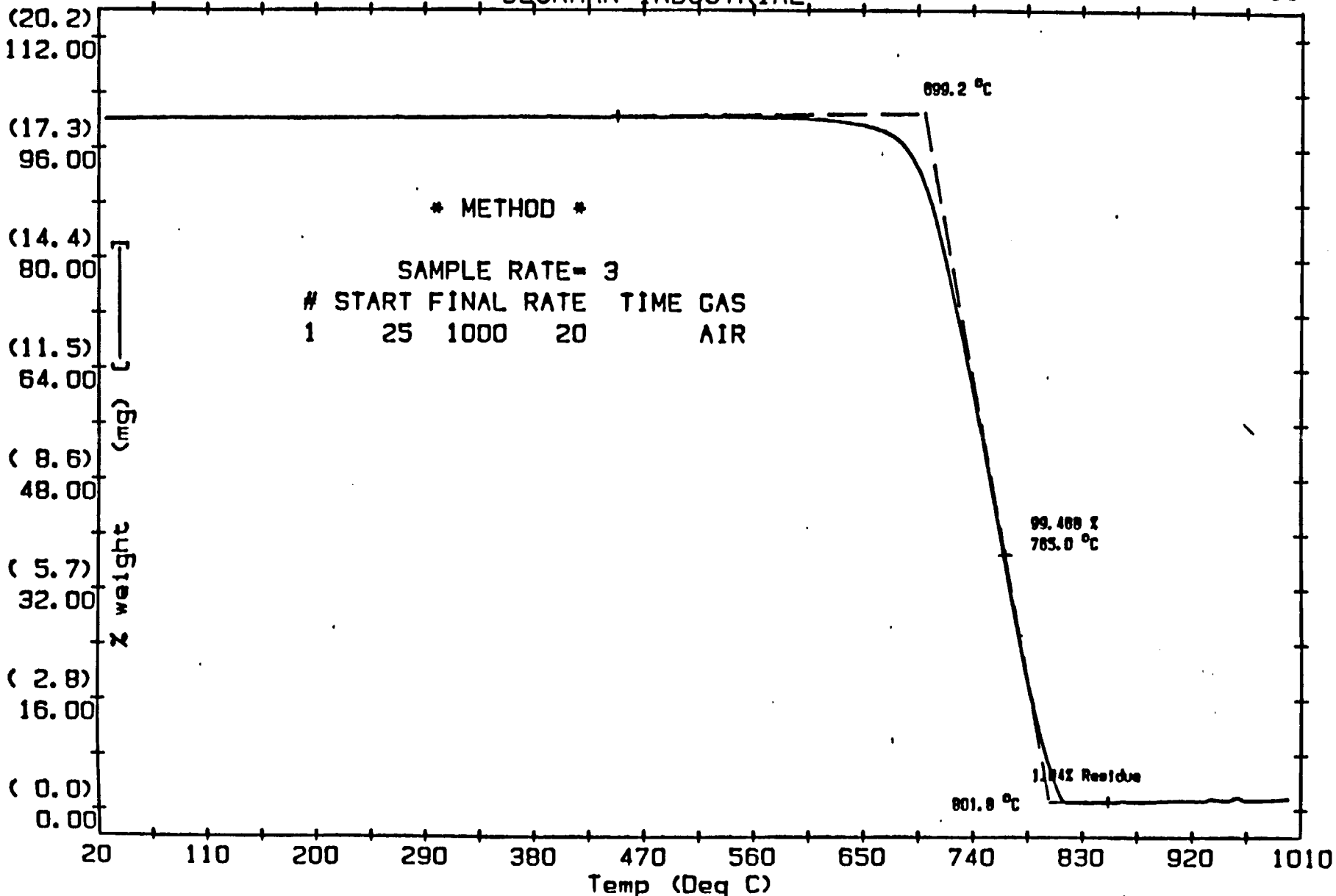
CHART 6B

Sample: 1-3
Size: 18.045 mg
Run No: MIR #12830 (I3)
Date: FEB/03/86 08:45

TGA

OMNITHERM DATA SYSTEM
BECKMAN INDUSTRIAL

Operator: M. WEGENER
Disk ID: DATA DISK #93
File No: D 37.DAT V2.1
Plotted: FEB/04/86 07:36



Beckman Industrial™ ANALYTICAL LABORATORY SERVICES

CHART 6C

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-22-86
#1 SAMPLE NASA LOT#1-1
SOLVENT ETHYL GLYCOL
C=0.013 mg/ml

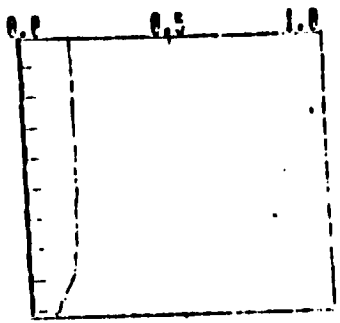
* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (PM)
D(MIN)	0.01(PM)
D(DIV)	0.50(PM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

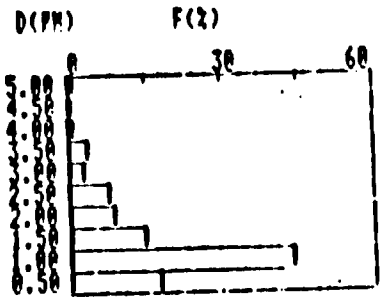


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.9	0.9
4.50-4.00	0.1	1.0
4.00-3.50	0.6	1.6
3.50-3.00	3.4	5.0
3.00-2.50	2.7	7.7
2.50-2.00	7.8	15.5
2.00-1.50	8.6	24.0
1.50-1.00	14.5	38.5
1.00-0.50	43.9	82.5
0.50-0.00	17.5	100.0

D(AVE) 0.87 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



LOT # 1-1
Sample #1

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-22-86
#2 SAMPLE NASA LOT#1-1
SOLVENT ETHYL GLYCOL
C=0.013 mg/ml

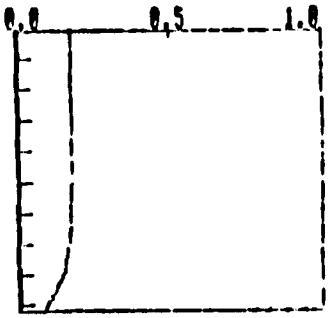
* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (PM)
D(MIN)	0.01(PM)
D(DIV)	0.50(PM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

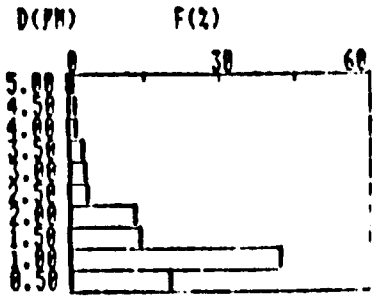


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.7	0.7
4.50-4.00	1.1	1.8
4.00-3.50	1.4	3.3
3.50-3.00	2.5	5.7
3.00-2.50	2.7	8.4
2.50-2.00	3.6	12.0
2.00-1.50	12.8	24.8
1.50-1.00	13.9	38.7
1.00-0.50	41.7	80.4
0.50-0.00	19.6	100.0

D(AVE) 0.86 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



LOT # 1-1
Sample #2

CHART 7A

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-24-86
#1 SAMPLE NASA LOT#1-2
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

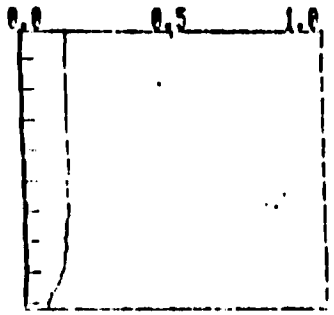
* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (PM)
D(MIN)	0.01(PM)
D(DIV)	0.50(PM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

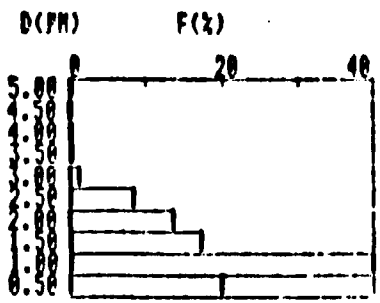
TIME ABSORBANCE



* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.0	0.0
4.00-3.50	0.0	0.0
3.50-3.00	0.0	0.0
3.00-2.50	1.1	1.1
2.50-2.00	8.2	9.3
2.00-1.50	13.7	23.0
1.50-1.00	17.2	40.2
1.00-0.50	39.9	80.1
0.50-0.00	19.9	100.0
D(AVE)	0.88 (PM)	

* DISTRIBUTION GRAPH (BY VOL.)



Lot #1-2
Sample #1

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-24-86
#2 SAMPLE NASA LOT#1-2
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

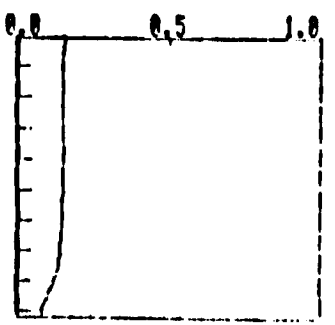
* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (PM)
D(MIN)	0.01(PM)
D(DIV)	0.50(PM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

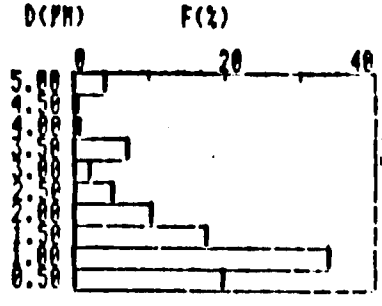
TIME ABSORBANCE



* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	4.1	4.1
4.50-4.00	0.2	4.3
4.00-3.50	0.4	4.8
3.50-3.00	7.1	11.9
3.00-2.50	1.9	13.8
2.50-2.00	4.8	18.7
2.00-1.50	10.3	29.0
1.50-1.00	17.5	46.5
1.00-0.50	33.8	80.3
0.50-0.00	19.7	100.0
D(AVE)	0.95 (PM)	

* DISTRIBUTION GRAPH (BY VOL.)



Lot #1-2
Sample #2

CHART 7B

HORIBA CAPA-500
PARTICLE ANALYZER

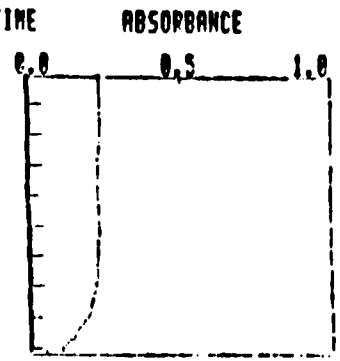
DATE 5-24-86
#1 SAMPLE NASA LOT#1-3
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (PM)
D(MIN)	0.01(PM)
D(DIV)	0.50(PM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

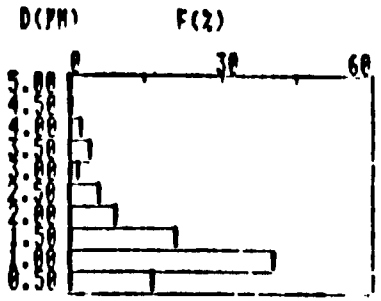


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.0	0.0
4.00-3.50	2.1	2.1
3.50-3.00	4.0	6.0
3.00-2.50	1.5	7.5
2.50-2.00	5.8	13.3
2.00-1.50	9.2	22.5
1.50-1.00	20.8	43.3
1.00-0.50	40.4	83.7
0.50-0.00	16.3	100.0

D(AVE) 0.92 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot#1-3
Sample#1

HORIBA CAPA-500
PARTICLE ANALYZER

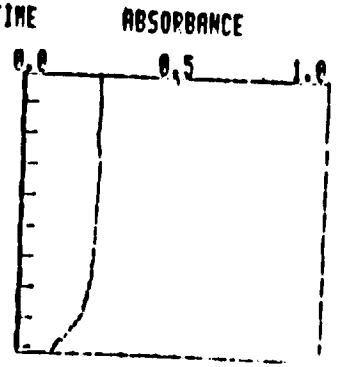
DATE 5-24-86
#2 SAMPLE NASA LOT#1-3
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (PM)
D(MIN)	0.01(PM)
D(DIV)	0.50(PM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

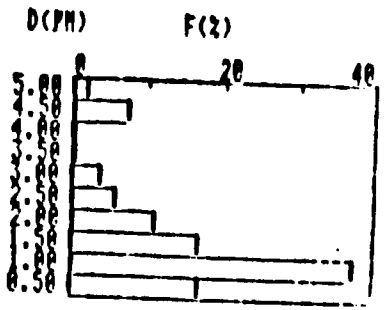


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	1.6	1.6
4.50-4.00	7.3	9.0
4.00-3.50	0.0	9.0
3.50-3.00	0.0	9.0
3.00-2.50	3.6	12.6
2.50-2.00	5.7	18.3
2.00-1.50	11.0	29.3
1.50-1.00	16.6	45.9
1.00-0.50	37.2	83.1
0.50-0.00	16.9	100.0

D(AVE) 0.95 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot#1-3
Sample#2

CHART 7C

TABLE OF CONTENTS

RESIN TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

USP-39A Resin Lot for NASA Lot# 1

CHARTS

U.S. Polymeric

RESIN TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

USP-39A Resin Lot for NASA Lot# 1

		#1-1	#1-2	
1. Resin Solids, % PTM-7C		79.4	80.2	
		80.2	80.5	
		81.2	81.7	
	AVG.	80.3	80.8	
	LOT# 1 AVERAGE			80.6
2. Specific Gravity @ 25°C PTM-29C		1.186	1.193	
	LOT# 1 AVERAGE			1.190
3. Viscosity, Brookfield, cps. @ 22.8°C PTM-14C		16,750	18,750	
	LOT# 1 AVERAGE			17,750
4. Gel Time, min:sec PTM-47B		3:30	3:47	
	LOT# 1 AVERAGE			3:39

5. Atomic Absorption, ppm CTM-53B (Values are averages of four determinations)	#1-1	#1-2	LOT1 AVG
Na	22.5	31.3	26.9
K	0.3	0.5	0.4
Ca	5.3	5.8	5.5
Mg	2.0	2.0	2.0
Li	0.0	0.0	0.0
AVG.	30.0	39.5	34.8

6. Volatiles, Gas Chromatography
CTM-55 — See Charts 6A-6B

7. TGA, % Weight Loss at 500°C CTM-51 (AIR)			
		39.1	37.9
	LOT# 1 AVERAGE		38.5

See Chart 7A-7B

8. DSC, temperature °C CTM-50A			
		187	187
	LOT# 1 AVERAGE		187

See Chart 8A-8B

9. HPLC
CTM-49A — See Chart 9A-9B

10. GPC, Average molecular wt. CTM-49A			
		1231	1291
	LOT# 1 AVERAGE		1261

See Chart 10A-10B

HITCO MATERIALS DIVISION
700 E. DYER ROAD, SANTA ANA, CALIFORNIA 92707 • (714) 549-1101 • TWX (910) 595-1130 • FAX # (714) 549-2858-5-2407

USP-39A Resin Lot for NASA Lot# 1

		#1-1	#1-2
11. pH, units CTM-1B		8.3	8.4
	LOT# 1 AVERAGE		8.4
12. Phenol Content, % CTM-55 Appendix 1		13.89	13.96
		13.77	14.03
	AVG.	13.83	14.00
	LOT# 1 AVERAGE		13.91
13. Chang's Index, ml. CTM-5B		23.4	23.8
	LOT# 1 AVERAGE		23.6

14. RDS, Minimum Viscosity, cps. CTM-57A

	Min. Visc.	°C
#1-1	229	115
#1-2	290	119
AVG.	259	117

See Charts 14A-14B

See Charts 15A-15B

15. NMR
Vendor procedure

U. S. Polymeric

Hamid M. Quraishi, Manager
Quality Assurance Department

TYPICAL GAS CHROMATOGRAPH SET-UP

Operator	G.T.J.	Date	12/4/86
Column		Detector	FID
Length	6 ft.	Voltage	
Dia.	1/4 in.	Sensit.	
Liquid Phase	AT-1000	Flow Rates, ml/min	
Wt. %	0.1	Hydrogen	60 Air 396
Support	GRAPHPAC	Scavenge	
Mesh	80/100	Split	
Carrier Gas	He	Temperature, °C	
Rotometer		Det. 220	Inj. 200
Inlet Press	60 psig	Column Initial	60
Rate	30 ml/min	Final	210
CHART SPEED		Rate	5°C/MIN
SAMPLE	USP39A, FI	Solvent	THF
Size	0.1 µl	Concn.	0.10257 g/ml

GAS CHROMATOGRAPHY STANDARD SOLVENT

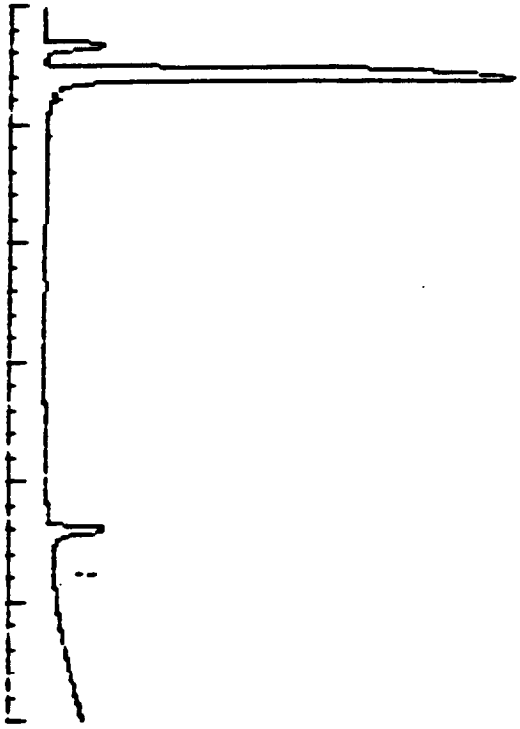
TEST METHOD CTM-55

STANDARD SOLVENT/MONOMER	RETENTION TIME (MINS.)
MEOH	.6
ETHANOL	1.18
MECL2	1.28
ACETONE	1.45
IPA	1.83
THF	3.08
ACETONITRILE	3.2
CRESOL	4.03
MEK	4.08
FURFURAL	15.03
TOLUENE	17.98
CHLOROBENZENE	19.6
PHENOL	22.08

NOTE: THF WAS USED TO DILUTE THE RESIN SAMPLES.

CHART 6A

*** REAL TIME CHROMATOGRAM ***



NAL FULL SCALE MV.=1000.00

AMPLE: USP39A 1-1
ISC.: C=0.10227GMS/ML

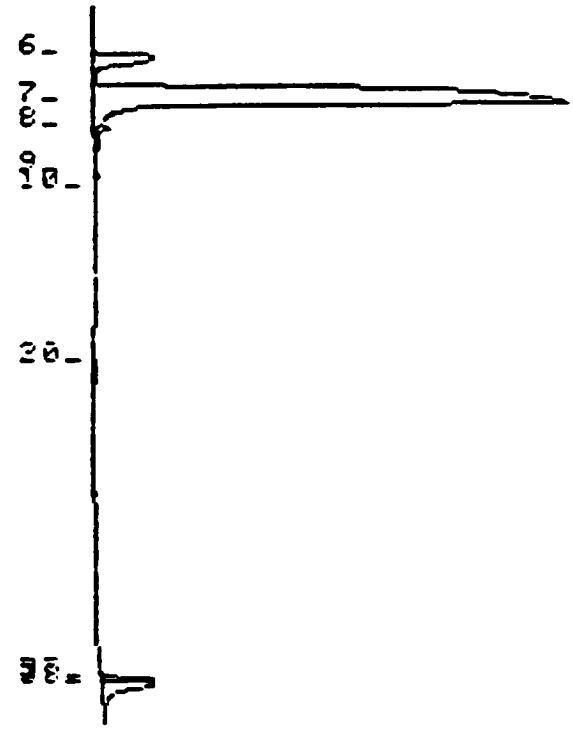
TIME: 11:15
ATE: 12/11/86
PERATOR: JGZ

UN TIME: 30.00 MINUTES
LAY TIME: 0.00
HAN: 0

PK NO.	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
3	.65	2553	.068	3	262
6	1.70	255870	6.813	2	11563
7	3.25	3126900	83.261	3	90865
8	4.03	55251	1.471	4	2537
9	5.55	6042	.161	4	481
0	6.05	7408	.197	4	163
0	11.75	7490	.199	3	355
7	21.95	107040	2.850	2	10311
8	22.13	186990	4.979	2	10194

TAL AREA= 3755543
RESHOLD= 1
IN PK.WIDTH= 15
REA REJECT= 1000

VERTICAL SCALE FACTOR:1X



SAMPLE: USP39A 1-1
MISC.: C=0.10227GMS/ML

TIME: 11:15
DATE: 12/11/86
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES
DELAY TIME: 0.00
CHAN: 0

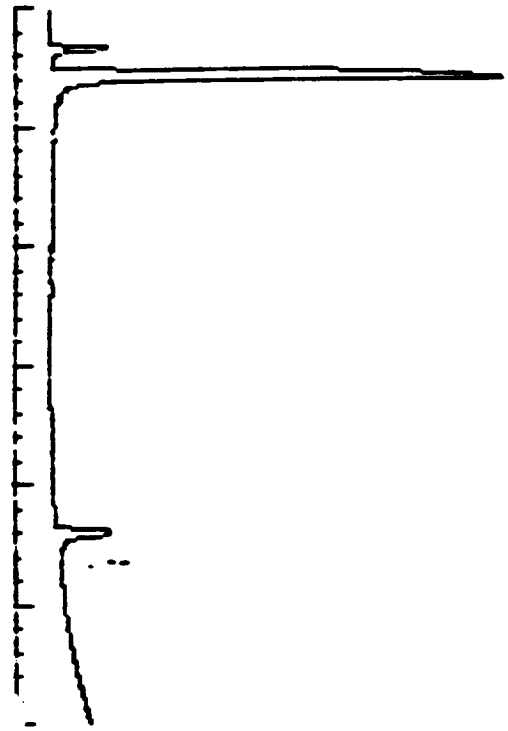
PK NO	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
6	1.70	255870	6.856	2	11563
7	3.25	3126900	83.785	3	90865
8	4.03	55251	1.480	4	2537
37	21.95	107040	2.868	2	10311
38	22.13	186990	5.010	2	10194

TOTAL AREA= 3732051
THRESHOLD= 1
MIN PK.WIDTH= 15
AREA REJECT= 10000

ORIGINAL PAGE IS
OF POOR QUALITY

CHART 6B

* * REAL TIME CHROMATOGRAM ***



FINAL FULL SCALE MV.=1000.00

SAMPLE: USP39A 1-2
MISC.: C=0.10006 GMS/ML

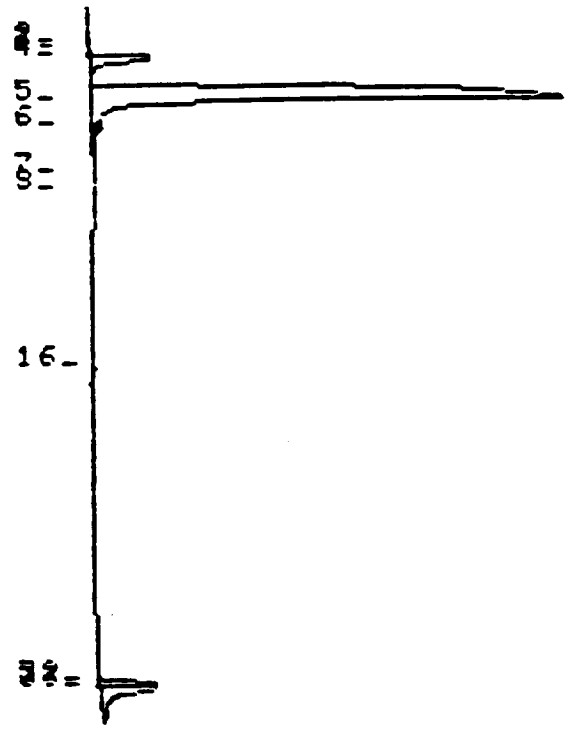
TIME: 11:56
DATE: 12/11/86
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES
DELAY TIME: 0.00
CHAN: 0

PN	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
	.65	1623	.056	2	202
	1.25	1128	.039	2	53
3	1.45	1143	.040	2	122
4	1.73	195650	6.780	2	11047
	3.15	2357000	81.673	3	87114
	4.00	33273	1.153	4	1558
7	5.58	3232	.112	4	314
	6.08	1817	.063	4	67
1	11.75	7514	.260	1	419
	21.98	104640	3.626	2	10260
	22.10	178880	6.198	2	10209

TOTAL AREA= 2885899
THRESHOLD= 1
MIN.PK.WIDTH= 15
AREA REJECT= 1000

VERTICAL SCALE FACTOR: 1X



SAMPLE: USP39A 1-2
MISC.: C=0.10006 GMS/ML

TIME: 11:56
DATE: 12/11/86
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES
DELAY TIME: 0.00
CHAN: 0

PK NO.	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
4	1.73	195650	6.818	2	11047
5	3.15	2357000	82.141	3	87114
6	4.00	33273	1.160	4	1558
32	21.98	104640	3.647	2	10260
33	22.10	178880	6.234	2	10209

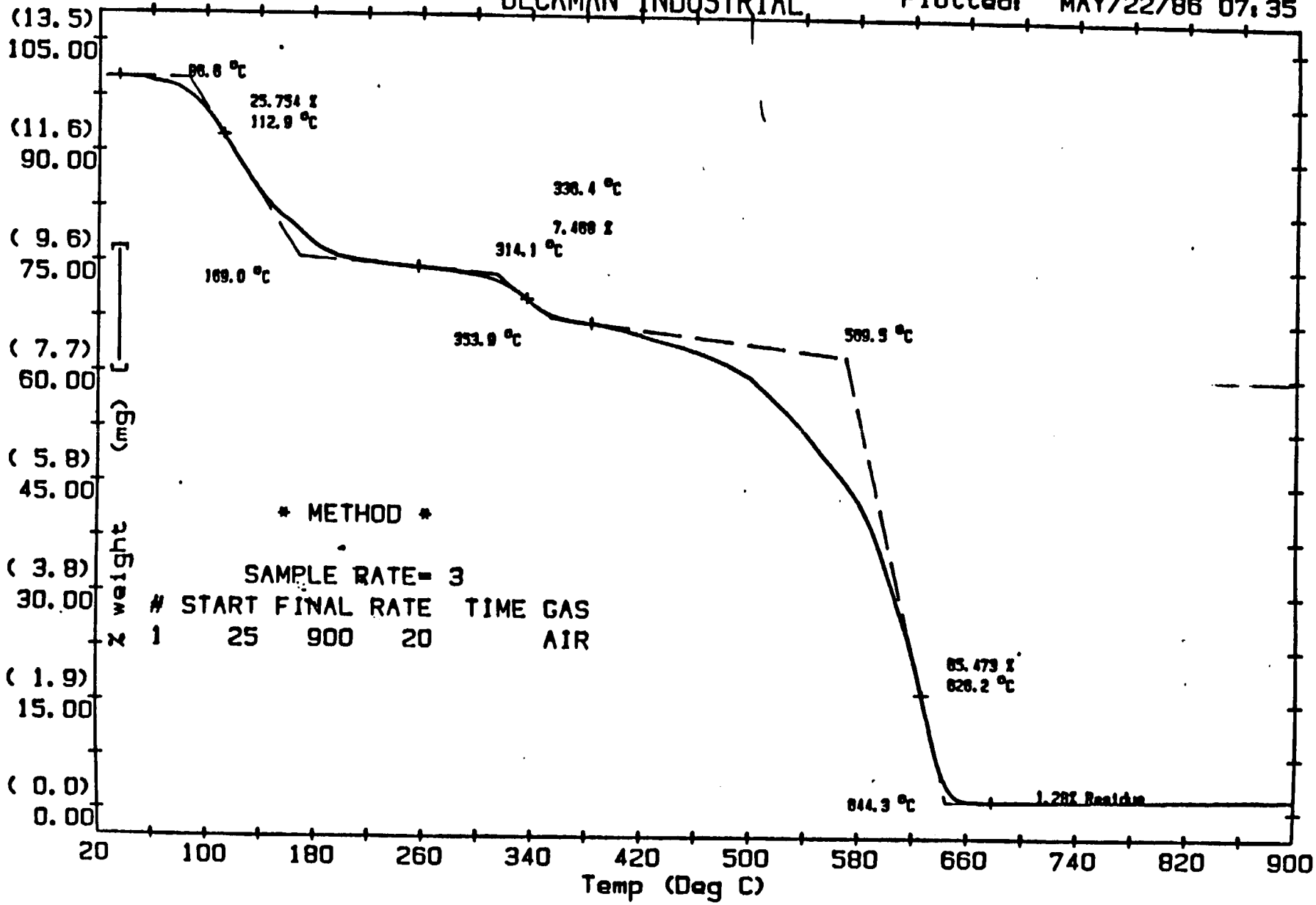
TOTAL AREA= 2869443
THRESHOLD= 1
MIN.PK.WIDTH= 15
AREA REJECT= 10000

Sample: USP39A71108 1-1
Size: 12.898 mg
Run No: MIR #13079 (12)
Date: MAY/21/86 07:14

TGA

OMNITHERM DATA SYSTEM
BECKMAN INDUSTRIAL

Operator: M. WEGENER
Disk ID: DATA DISK #107
File No: D 32.DAT V2.1
Plotted: MAY/22/86 07:35



* METHOD *

SAMPLE RATE= 3

#	START	FINAL	RATE	TIME	GAS
1	25	900	20		AIR

ORIGINAL PAGE IS
OF POOR QUALITY

CHART 7A

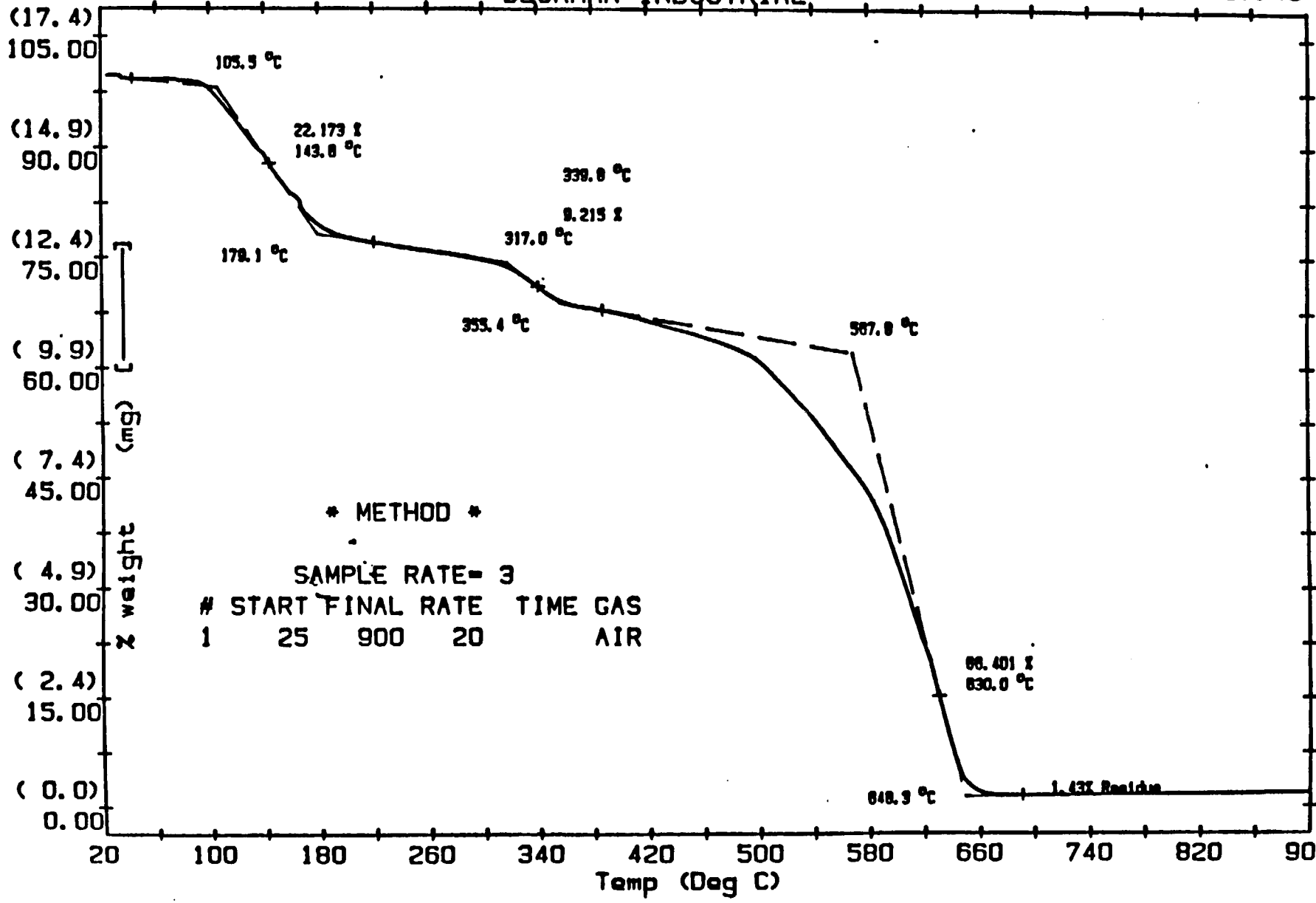
Beckman Industrial™ ANALYTICAL LABORATORY SERVICES

Sample: USP39A71108 1-2
Size: 16.572 mg
Run No: MIR #13079 (12)
Date: MAY/21/86 08:28

TGA

OMNITHERM DATA SYSTEM
BECKMAN INDUSTRIAL

Operator: M. WEGENER
Disk ID: DATA DISK #107
File No: D 33.DAT V2.1
Plotted: MAY/22/86 07:45



Beckman Industrial™ ANALYTICAL LABORATORY SERVICES

CHART 7B

ORIGINAL PAGE IS
OF POOR QUALITY

PART NO. 990088

CHART 8A

RUN NO.___ DATE 4/3/86

OPERATOR [illegible]

SAMPLE:

1-1

ATM H_2 @ 1 atm.

FLOW RATE 40 ml/min.

T-AXIS

SCALE, °C/in 50

PROG. RATE, °C/min 20

HEAT ✓ COOL ___ ISO ___

SHIFT, in 0

-1° 1C°

DTA-DSC

SCALE, °C/in 1.0/5

[mcal/sec]/in ___

WEIGHT, mg 3.4

REFERENCE

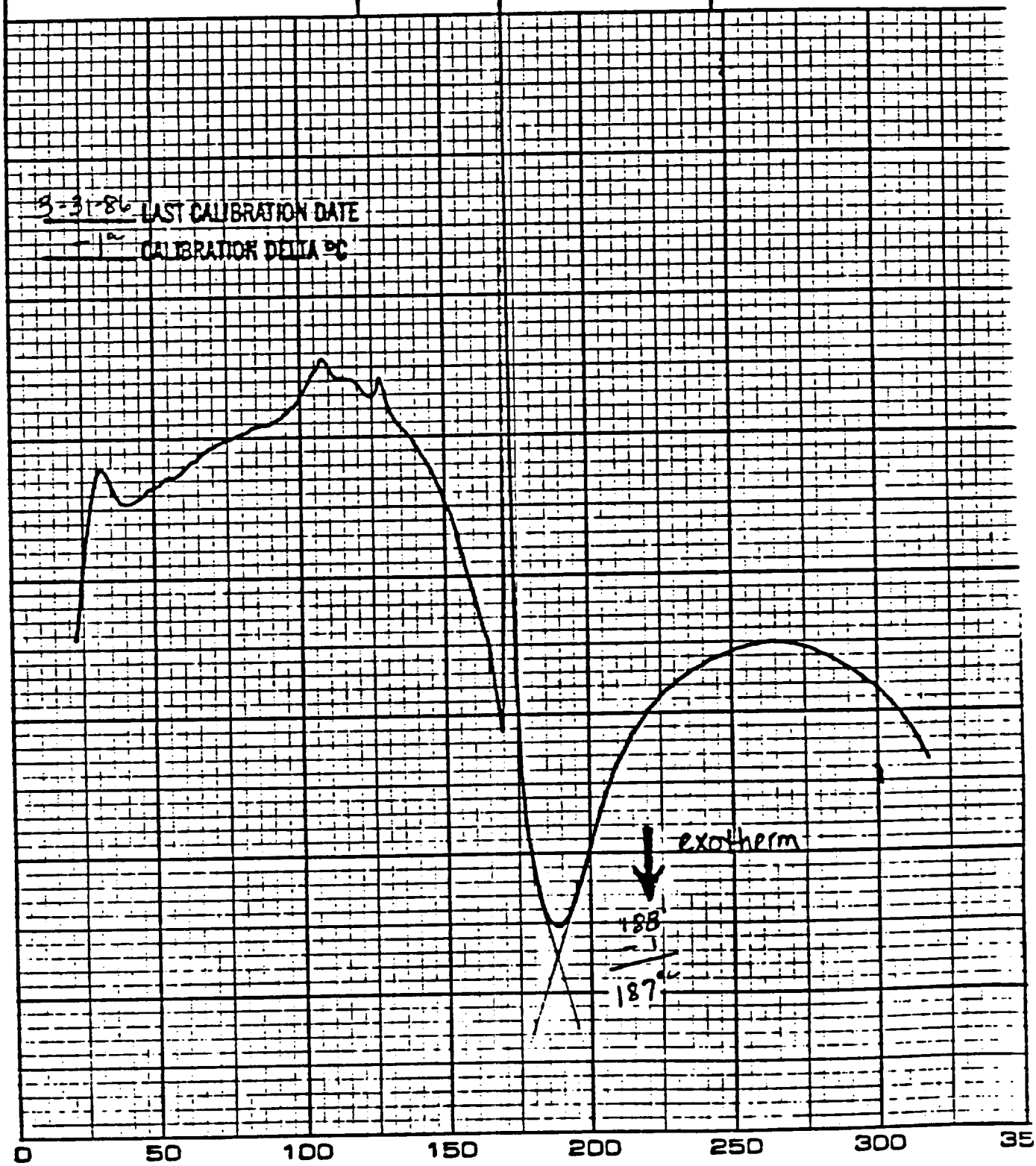
1 AL CUP & SEA

DUPONT Instruments

MEASURED VARIABLE ___

3-31-86 LAST CALIBRATION DATE

1° CALIBRATION DELTA °C



TEMPERATURE, °C [CHRON

ORIGINAL PAGE IS
OF POOR QUALITY

PART NO. 990088

CHART 8B

RUN NO. ___ DATE 4/3/86
OPERATOR JJ
SAMPLE: 1-2
ATM He @ 1 atm.
FLOW RATE 40 ml/min

T-AXIS
SCALE, °C/in 50
PROG. RATE, °C/min 20
HEAT / COOL ___ ISO ___
SHIFT, in 0
- 1° ΔC°

DTA-DSC
SCALE, °C/in 1.0/5
(mcal/sec)/in ___
WEIGHT, mg 3.4
REFERENCE
1AL cup & SEAL

DUPONT Instruments

MEASURED VARIABLE ___

3-31-86 LAST CALIBRATION DATE
1°C CALIBRATION DELTA °C

exotherm
188°C
187°C

0 50 100 150 200 250 300 35

TEMPERATURE, °C (CHRO

Method recorded in file: A:PHENOLIC.MET

CHART 9A

DATA FILE A:PHEN026.HDR TAKEN 09-05-1986 11:06:32

********* AREA PERCENT REPORT *********

Sample Name: USP39A,1-1,C=6.54 Operator Initials: JGZ
Date: 09-05-1986 11:06:32 Method:PHENOLIC DATA FILE: A:PHEN026.PTS
Interface: 4 Cycle#: 26 Channel#: 0 Vial#: N.A.
Starting Peak Width: 10 Threshold: .01
Instrument Type: BECKMAN HPLC Column Type: MICROBONDAPAK C-18
Solvent Description: THF/WATER, 2:1 BY WEIGHT
Operating Conditions: R.T., FLOWRATE=1.5 ML/MIN
Detector 0: 220NM/.5AU Detector 1:
Misc. Information: LENGTH=25

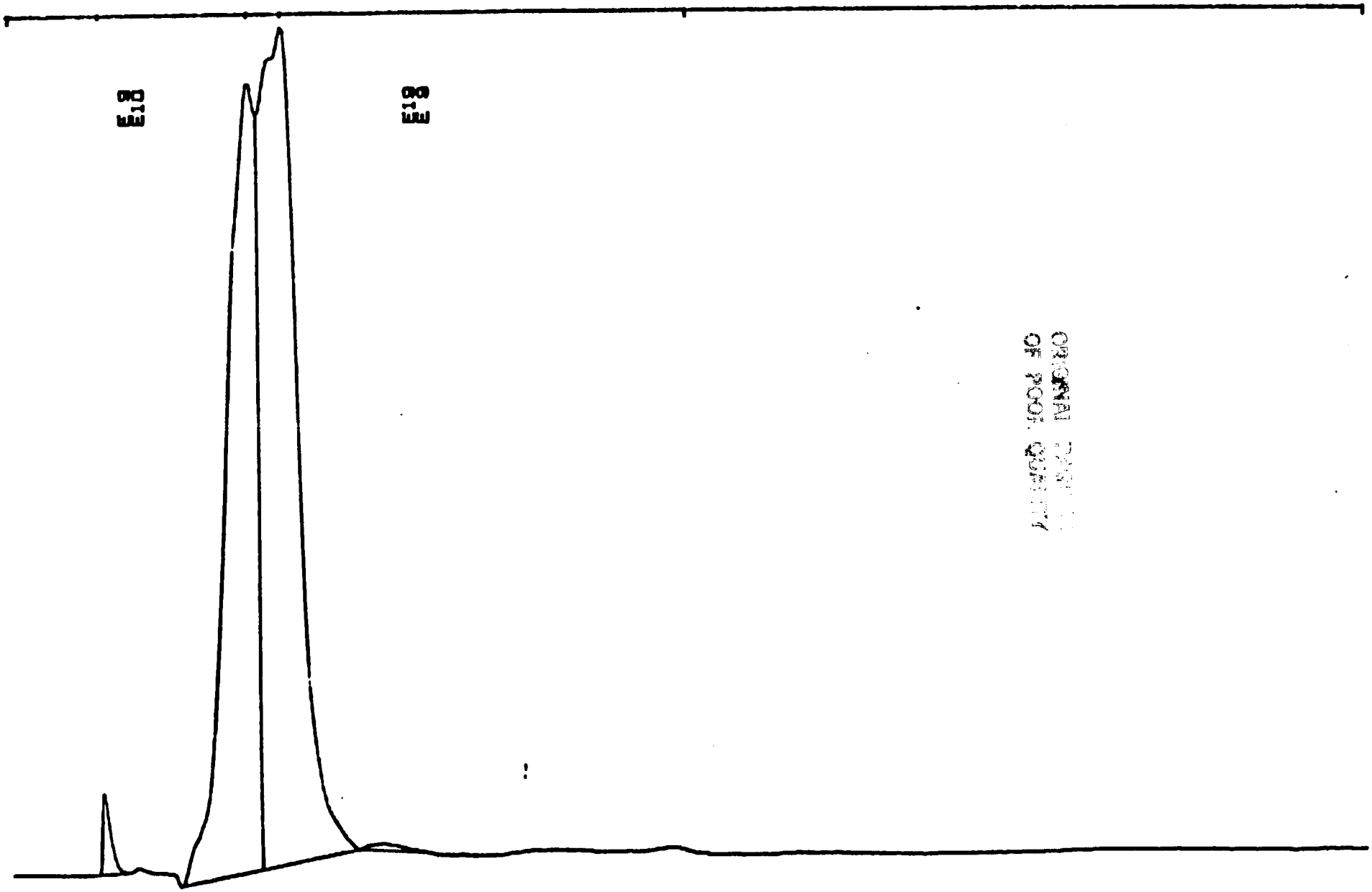
Starting Delay: 0.00 Ending Retention Time: 10.00

Pk No.	Ret Time	Peak Area	Area %	B L	Peak Ht.	Normalized %	Area/ Height
1	0.70	2030	1.1563	1	510	2.103	4.0
2	1.80	76982	43.8499	2	4940	79.736	15.6
3	2.05	96545	54.9937	2	5248	100.000	18.4

Total Area: 175557 Area Reject: 1000 One sample per 1.000 sec.

--TA --- E(---J28 ---JM - 00 ----. T- 10.-- MIN 'OW -7(= 3.4-- Hv. ---3H : .E= 1.7I Iv.
USP-39A,)-1, C=0.54 MG/ML, 9/5/86, JCZ

0.70
1.80
2.05



TA FILE A:PHEND19.HDR TAKEN 09-01-1986 13:18:26

********* AREA PERCENT REPORT *********

Operator Initials: JGZ
Sample Name: USP39A,1-2,C=5.07
Date: 09-01-1986 13:18:26 Method:PHENDLIC
DATA FILE: A:PHEND19.PTS
Interface: 4 Cycle#: 19
Channel#: 0 Vial#: N.A.
Starting Peak Width: 10 Threshold: .01

Instrument Type: BECKMAN HPLC
Column Type: MICROBONDAPAK C-18
Solvent Description: THF/WATER, 2:1 BY WEIGHT
Operating Conditions: R.T., FLOWRATE=1.5 ML/MIN
Detector 0: 220NM/.5AU
Detector 1:
Misc. Information: LENGTH=25

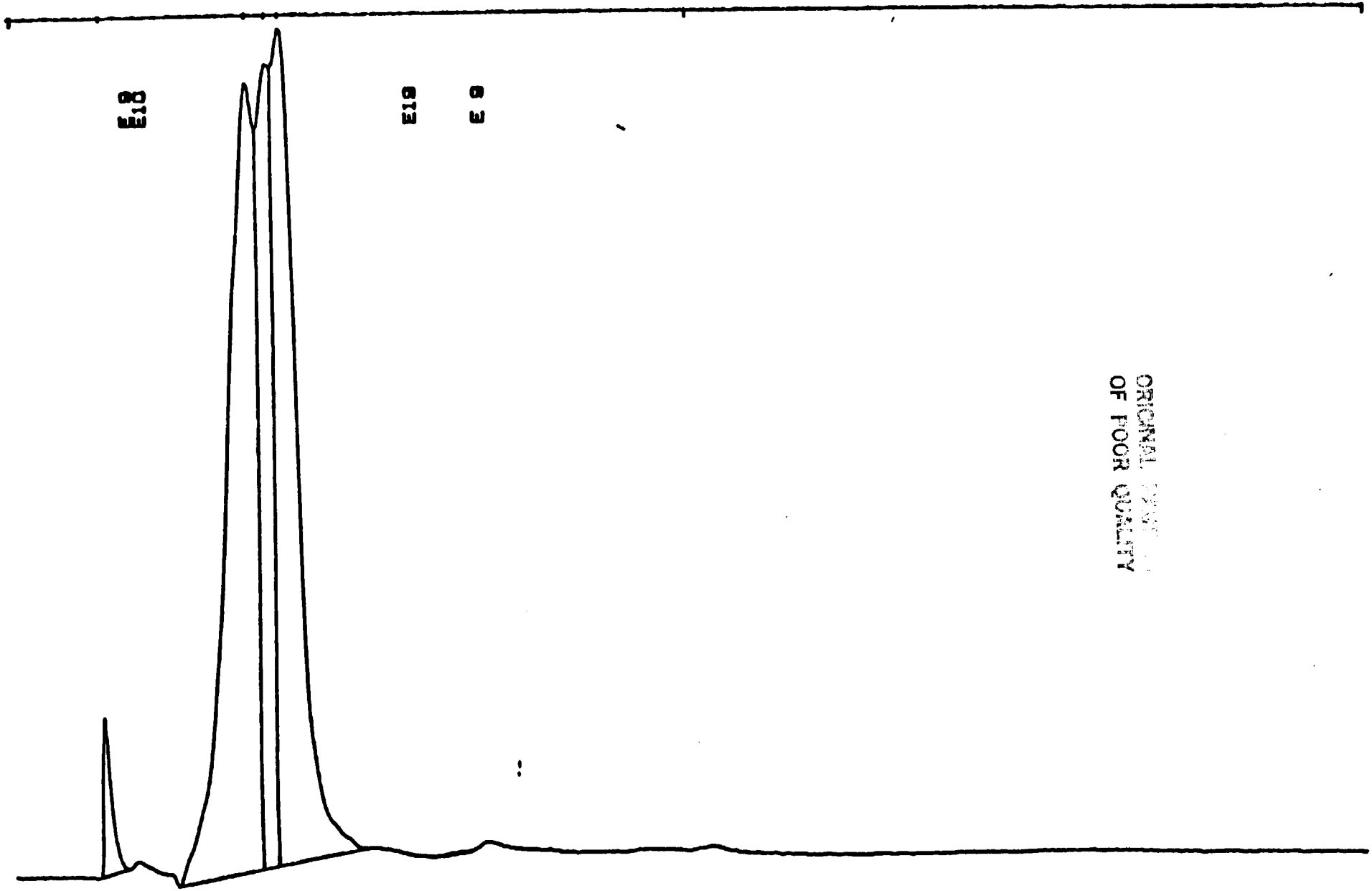
Starting Delay: 0.00
Ending Retention Time: 10.00

	Ret Time	Peak Area	Area %	B L	Peak Ht.	Normalized %	Area/ Height
1	0.70	4065	2.2807	1	1019	5.202	4.0
2	1.78	78141	43.8419	2	5072	100.000	15.4
3	1.93	34258	19.2209	2	5165	43.841	6.6
4	2.03	61769	34.6565	2	5379	79.049	11.5

Total Area: 178233 Area Reject: 1000 One sample per 1.000 sec.

DAT 1 END FRO 0.1 IIN. LO AL 5 2 M HIG CAL 10. 1 M
USP-39A, 1-2, C=5.07 MG/ML, 9/2/86, JGZ

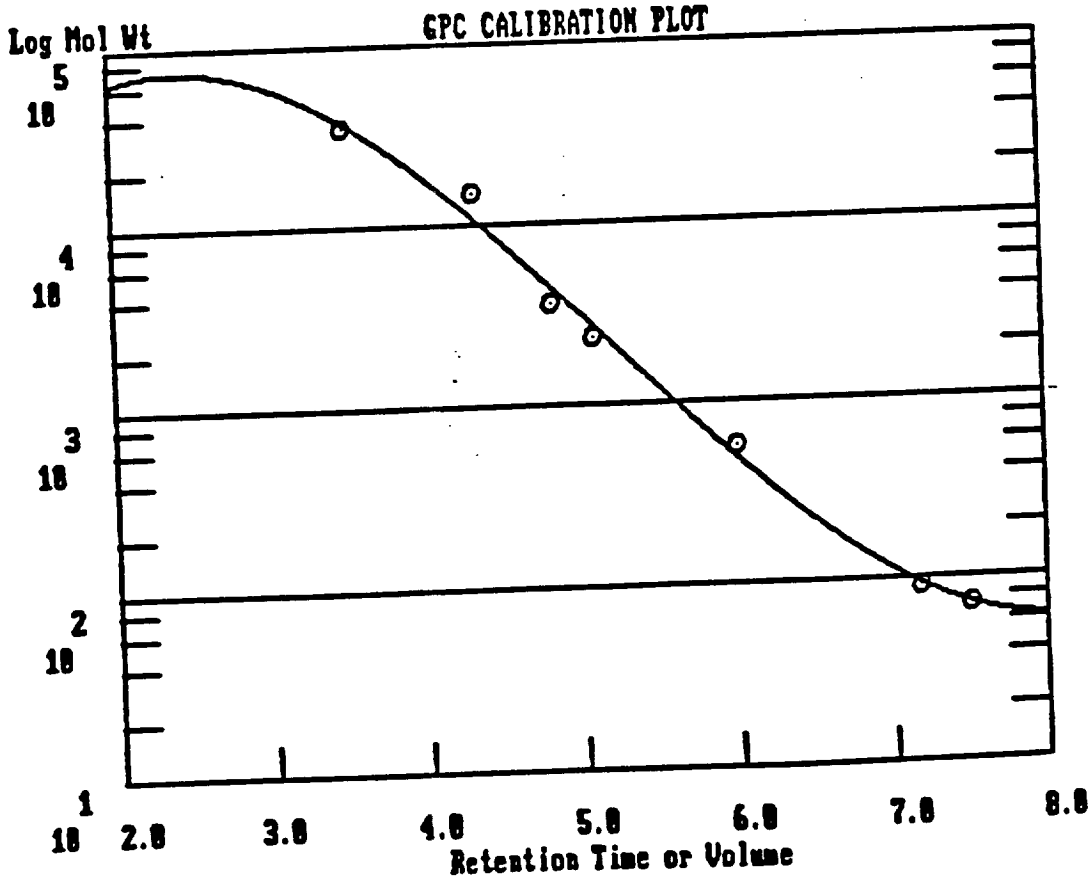
0.70
1.78
1.83



*** Calibration Data ***
Calibration Name:
Misc Information:

Fit Type: 3
Log Mol Wt = A + Bx + Cx^2 + Dx^3
A= 2.538977 B= 2.115815 C= -.5646824 D= 3.606432E-02
Coefficient of Determination: 0.9902

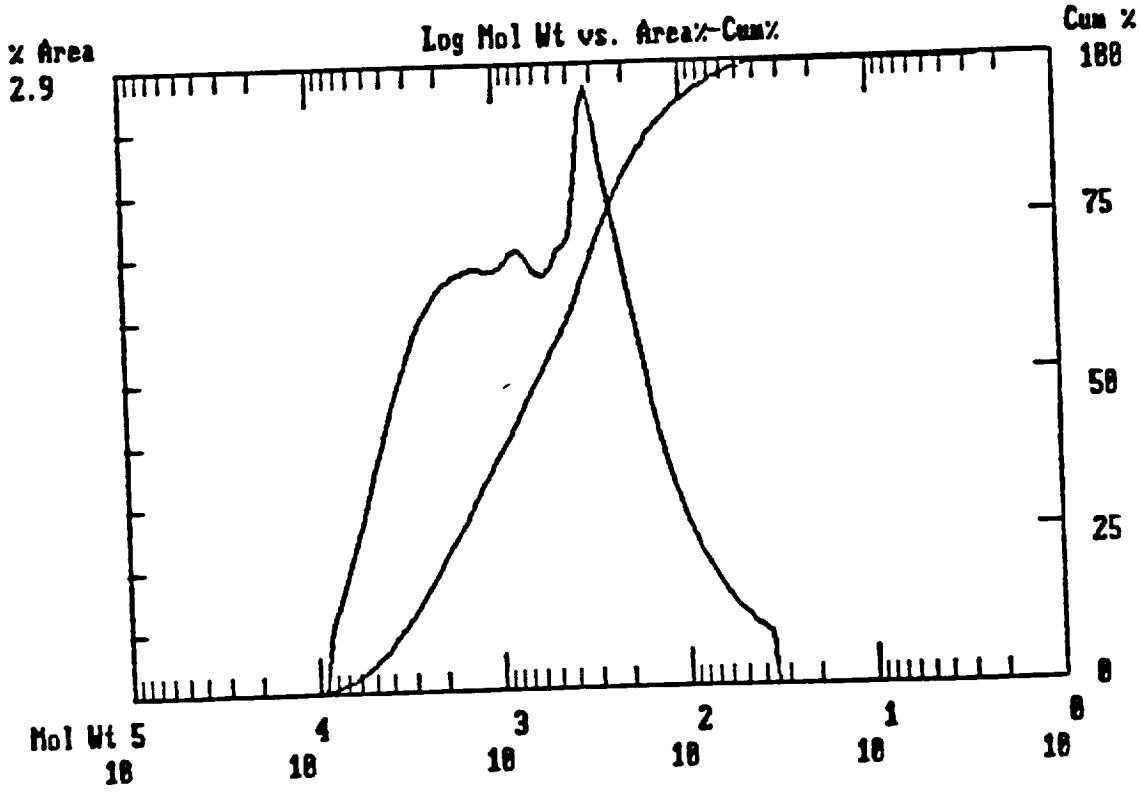
Ret Time	Molecular Weight	Log Mol Wt
3.50	35000	4.544
4.33	15000	4.176
4.83	3600	3.556
5.09	2350	3.371
6.00	570	2.756
7.17	92	1.964
7.50	72	1.857



ATA FILE A:GPC31.HDR TAKEN 08-05-1986 17:39:57

********** GPC REPORT **********

```
**********************************************************************************
* ********************************************************************************
  Sample Name: USP39A 1-1=2.68                    Operator Initials: GBF          *
  Date:  08-05-1986 15:00:24 Method:              DATA FILE: A:GPC31.PTS          *
  Interface: 5               Cycle#:  31          Channel#: 0    Vial#: N.A.      *
  Starting Peak Width:  60   Threshold:  0                                        *
**********************************************************************************
    Instrument Type: HPLC/BECKMAN                 Column Type: ULTRASTYRAGEL 500A  *
              Solvent Description: THF                                           *
     Operating Conditions: T=35C FLOWRATE=2.0ML/MIN                              *
                Detector 0: 254NM/.1AU            Detector 1:                   *
       Misc. Information: CALIBRATION/GPC                                        *
**********************************************************************************
* ********************************************************************************
Starting Delay:    0.00                       Ending Retention Time:    10.00
Calibration file: GPCPHEN
Molecular Weight Distribution Averages
Baseline TIMES:    3.85 to    10.00   MW:      22295 to          2
Process  TIMES:    3.85 to    10.00   MW:      22295 to          2
Total Area:       211188
Mw=                 1231
Mn=                  312
Mw/Mn=            3.9362
Mz=                 3069
Mv=                 1076
```



TA FILE A:GPC32.HDR TAKEN 08-05-1986 17:44:23

********* GPC REPORT *********

```
**********************************************************************************
S. ple Name: USP39A 1-2=2.6B                    Operator Initials: GBF          *
D. .e: 08-05-1986 15:15:18 Method:              DATA FILE: A:GPC32.PTS          *
Interface: 5                  Cycle#: 32        Channel#: 0    Vial#: N.A.      *
St arting Peak Width: 60      Threshold: 0                                      *
**********************************************************************************
 Instrument Type: HPLC/BECKMAN                Column Type: ULTRASTYRAGEL 500A   *
            Solvent Description: THF                                            *
  Operating Conditions: T=35C FLOWRATE=2.0ML/MIN                                *
          Detector 0: 254NM/.1AU                Detector 1:                     *
    Misc. Information: CALIBRATION/GPC                                          *
**********************************************************************************
a. ting Delay:   0.00                         Ending Retention Time:   10.00
libration file: GPCPHEN
lecular Weight Distribution Averages
s line TIMES:    3.85 to   10.00   MW:    22295 to        2
o_ess TIMES:     3.85 to   10.00   MW:    22295 to        2
tal Area:       211824
=                 1291
=                  324
/Mn=            3.9783
=                 3246
=                 1126
```

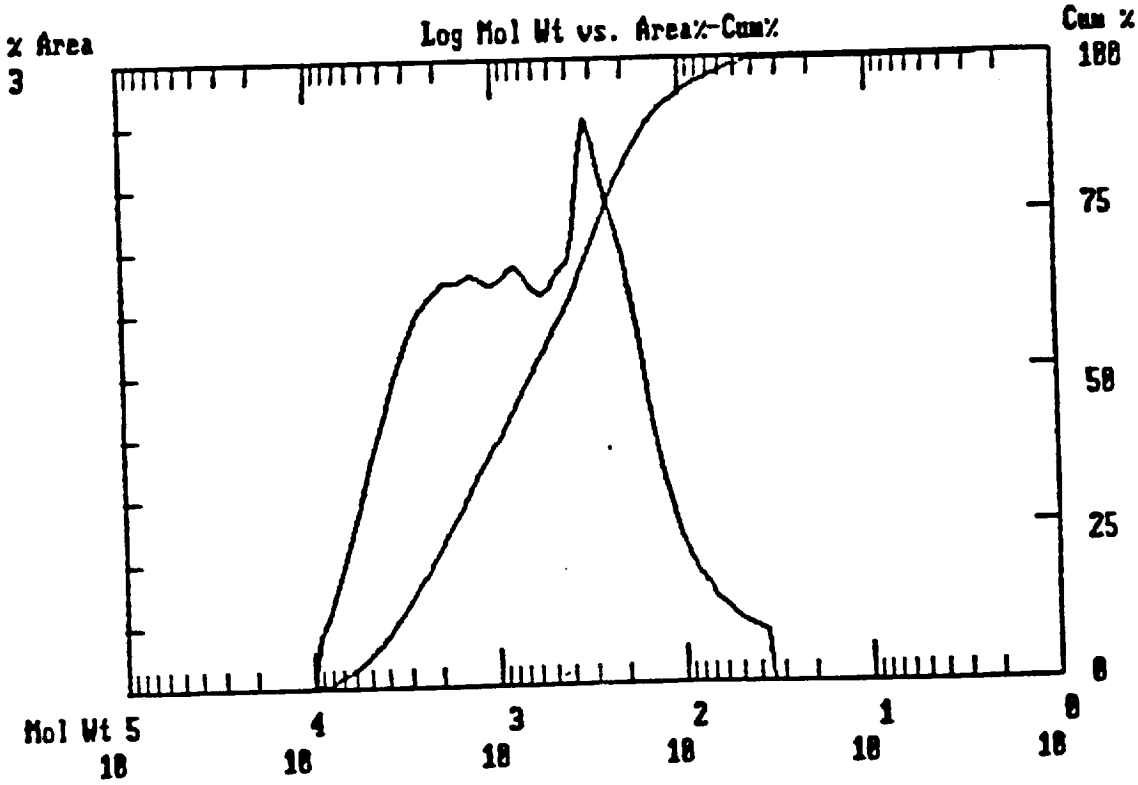
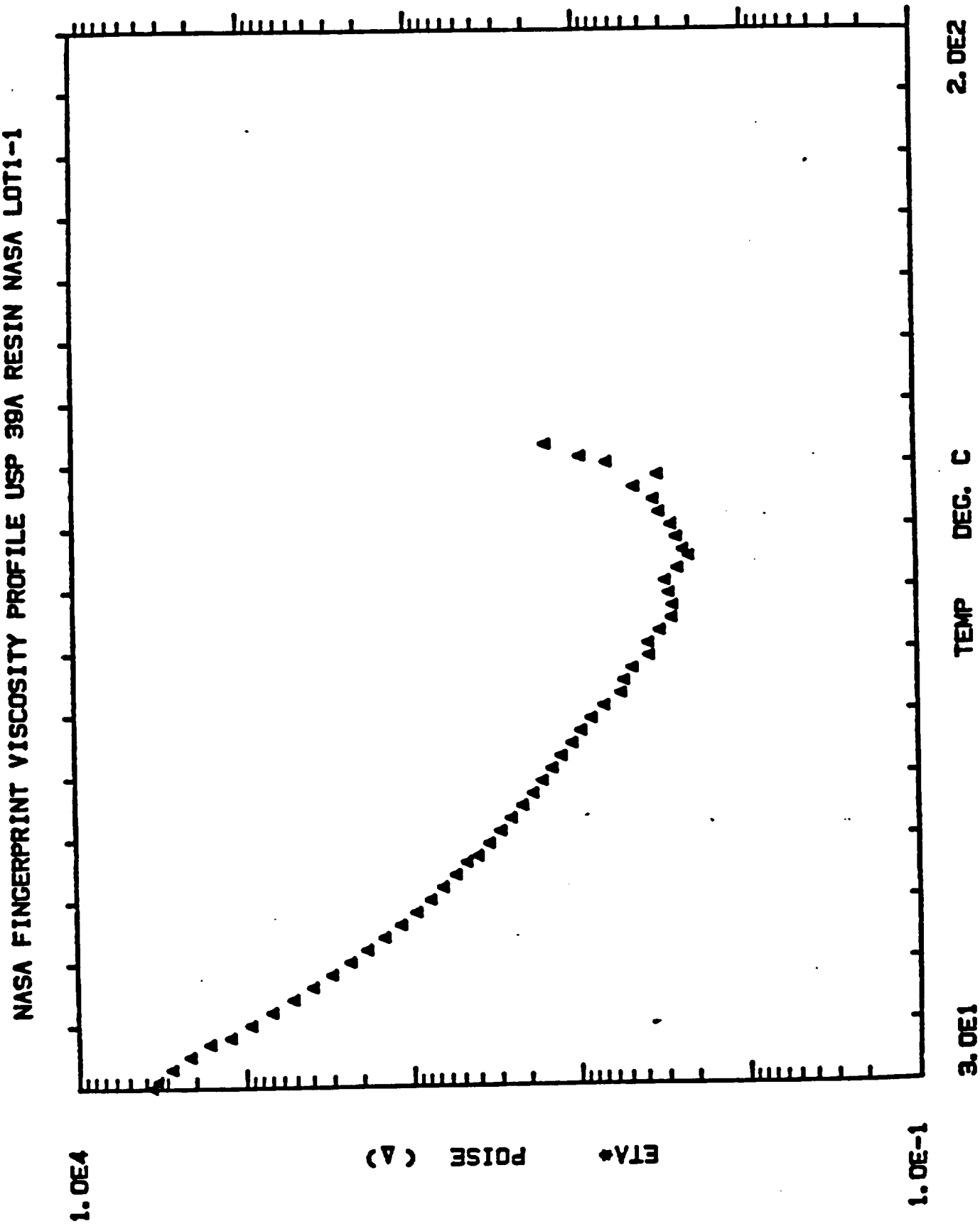


CHART 14A


NASA FINGERPRINT VISCOSITY PROFILE USP 38A RESIN NASA LOT1-1
ETA* POISE (A)
TEMP DEG. C
1.0E4
1.0E-1
2.0E2
3.0E1

Rheometrics RECAP II

p--iment No. : 8 Sample No. : 1

tle:
SA FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT1-1

e ator :CP

t and Time : Monday, August 18, 1986 - 15:30:51

erating Mode : DYNAMIC

e > Type : CURE

cmetry : DISK & PLATE
RADIUS : 25.00
GAP : 0.50

t s :
RAIN =50%
EQUENCY =10 RAD/SEC

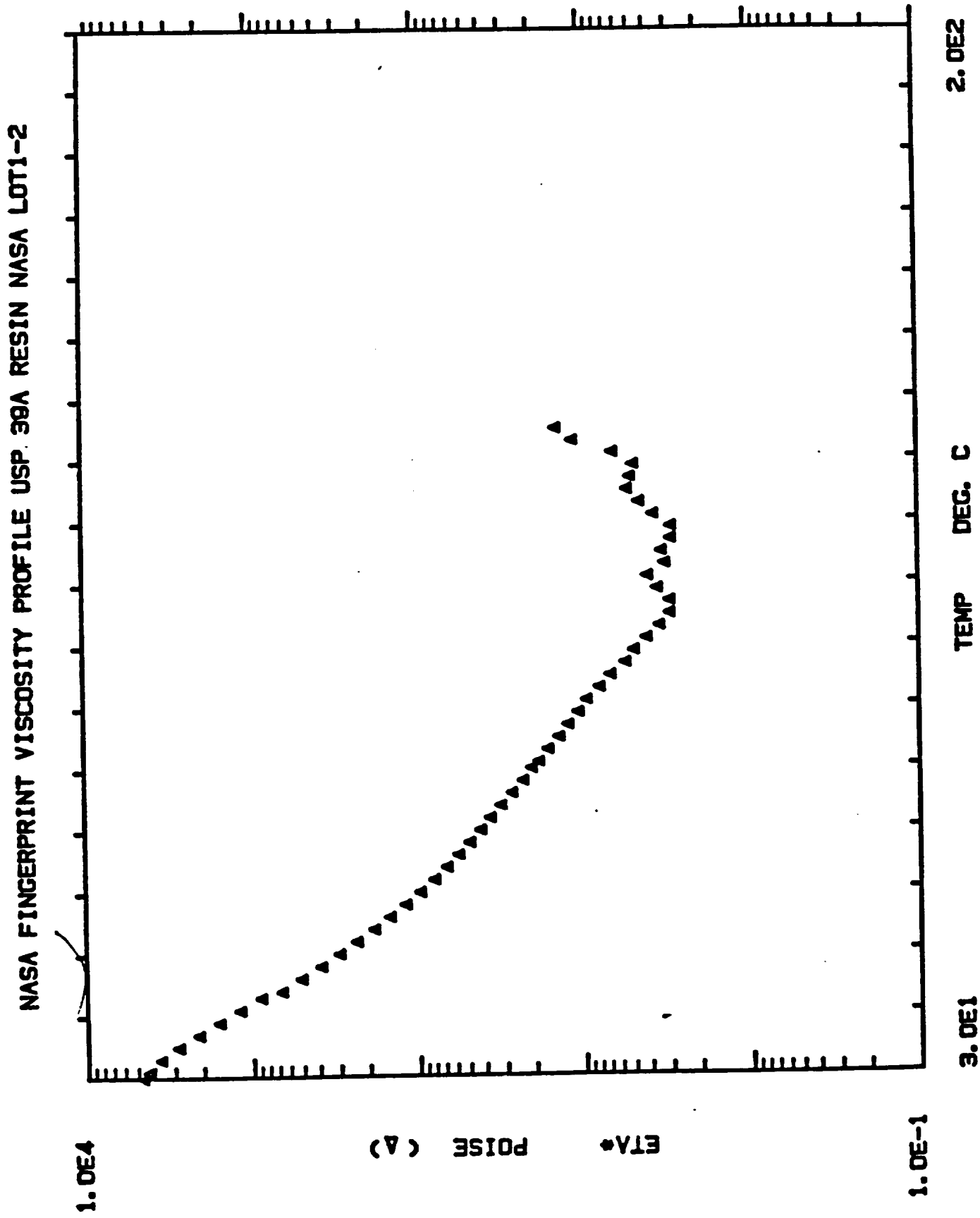
SA FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT1-1

NO.	ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
	3.813e+003	3.813e+003	6.049e+001	4.876e+002	2.000e-001	3.000e+001
2	3.514e+003	3.514e+003	6.792e+001	4.490e+002	1.000e+000	3.100e+001
3	2.873e+003	2.873e+003	4.505e+001	3.658e+002	2.000e+000	3.300e+001
	2.233e+003	2.232e+003	4.101e+001	2.837e+002	3.000e+000	3.500e+001
5	1.691e+003	1.690e+003	3.527e+001	2.144e+002	4.000e+000	3.700e+001
6	1.277e+003	1.277e+003	3.445e+001	1.615e+002	5.000e+000	3.800e+001
	9.594e+002	9.588e+002	3.542e+001	1.211e+002	6.000e+000	4.000e+001
	7.177e+002	7.169e+002	3.398e+001	9.048e+001	7.000e+000	4.200e+001
9	5.372e+002	5.368e+002	2.240e+001	6.768e+001	8.000e+000	4.400e+001
10	4.111e+002	4.104e+002	2.378e+001	5.171e+001	9.000e+000	4.600e+001
11	3.153e+002	3.144e+002	2.382e+001	3.963e+001	1.000e+001	4.800e+001
12	2.442e+002	2.432e+002	2.197e+001	3.070e+001	1.100e+001	5.000e+001
13	1.934e+002	1.921e+002	2.359e+001	2.429e+001	1.200e+001	5.200e+001
14	1.529e+002	1.514e+002	2.136e+001	1.921e+001	1.300e+001	5.400e+001
15	1.214e+002	1.200e+002	1.858e+001	1.524e+001	1.400e+001	5.600e+001
16	9.808e+001	9.666e+001	1.659e+001	1.232e+001	1.500e+001	5.800e+001
17	8.082e+001	7.951e+001	1.448e+001	1.015e+001	1.600e+001	6.000e+001
18	6.811e+001	6.697e+001	1.242e+001	8.554e+000	1.700e+001	6.200e+001
19	5.720e+001	5.620e+001	1.064e+001	7.178e+000	1.800e+001	6.400e+001
20	4.908e+001	4.819e+001	9.274e+000	6.157e+000	1.900e+001	6.600e+001
21	4.220e+001	4.139e+001	8.188e+000	5.291e+000	2.000e+001	6.700e+001
22	3.613e+001	3.546e+001	6.922e+000	4.536e+000	2.100e+001	6.900e+001
23	3.089e+001	3.033e+001	5.841e+000	3.879e+000	2.200e+001	7.100e+001
24	2.675e+001	2.623e+001	5.276e+000	3.358e+000	2.300e+001	7.300e+001
25	2.282e+001	2.244e+001	4.144e+000	2.867e+000	2.400e+001	7.500e+001
26	1.974e+001	1.940e+001	3.659e+000	2.477e+000	2.500e+001	7.700e+001
27	1.732e+001	1.699e+001	3.366e+000	2.175e+000	2.600e+001	7.900e+001
28	1.517e+001	1.488e+001	2.933e+000	1.903e+000	2.700e+001	8.100e+001
29	1.335e+001	1.317e+001	2.145e+000	1.676e+000	2.800e+001	8.300e+001
30	1.149e+001	1.132e+001	1.950e+000	1.442e+000	2.900e+001	8.500e+001
31	1.013e+001	9.893e+000	2.167e+000	1.272e+000	3.000e+001	8.700e+001
32	8.766e+000	8.654e+000	1.396e+000	1.100e+000	3.100e+001	8.900e+001
33	7.337e+000	7.274e+000	9.610e-001	9.215e-001	3.200e+001	9.100e+001
34	5.831e+000	5.798e+000	6.145e-001	7.324e-001	3.300e+001	9.300e+001
35	5.574e+000	5.555e+000	4.656e-001	6.994e-001	3.400e+001	9.500e+001
36	4.962e+000	4.953e+000	3.040e-001	6.234e-001	3.500e+001	9.700e+001
37	3.948e+000	3.939e+000	2.647e-001	4.954e-001	3.600e+001	9.900e+001
38	3.987e+000	3.985e+000	1.262e-001	5.009e-001	3.700e+001	1.010e+002
39	3.405e+000	3.405e+000	0.723e-001	4.275e-001	3.800e+001	1.030e+002
40	2.898e+000	2.898e+000	0.000e+000	3.642e-001	3.900e+001	1.050e+002
41	2.857e+000	2.853e+000	1.393e-001	3.589e-001	4.000e+001	1.070e+002
42	3.003e+000	2.947e+000	5.728e-001	3.770e-001	4.100e+001	1.090e+002
43	3.157e+000	2.947e+000	1.133e+000	3.967e-001	4.200e+001	1.110e+002
44	2.663e+000	2.398e+000	1.157e+000	3.342e-001	4.300e+001	1.130e+002
45	2.290e+000	1.989e+000	1.135e+000	2.874e-001	4.400e+001	1.150e+002
46	2.477e+000	2.312e+000	8.892e-001	3.106e-001	4.500e+001	1.160e+002
47	2.705e+000	2.249e+000	1.504e+000	3.394e-001	4.600e+001	1.180e+002
48	2.911e+000	2.580e+000	1.347e+000	3.653e-001	4.700e+001	1.200e+002
49	3.417e+000	3.001e+000	1.634e+000	4.284e-001	4.800e+001	1.220e+002
50	3.687e+000	3.239e+000	1.761e+000	4.625e-001	4.900e+001	1.240e+002

A FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT1-1

	ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
1	4.786e+000	4.450e+000	1.759e+000	5.999e-001	5.000e+001	1.260e+002
2	3.464e+000	3.193e+000	1.343e+000	4.344e-001	5.100e+001	1.280e+002
3	6.979e+000	6.453e+000	2.657e+000	8.741e-001	5.200e+001	1.300e+002
4	1.003e+001	9.418e+000	3.457e+000	1.258e+000	5.300e+001	1.310e+002
5	1.616e+001	1.532e+001	5.138e+000	2.025e+000	5.400e+001	1.330e+002

CHART 14B


NASA FINGERPRINT VISCOSITY PROFILE USP 30A RESIN NASA LOT1-2
ETA* POISE (A)
1.0E4
1.0E-1
TEMP DEG. C
2.0E2
3.0E1

Rheometrics RECAP II

perimeni No. : 7 Sample No. : 1

t e:
SA FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT1-2

e ator :CP

te and Time : Monday, August 18, 1986 - 13:42:09

e ating Mode : DYNAMIC

e p Type : CURE

ometry : DISK & PLATE
RADIUS : 25.00
GAP : 0.50

t s :
F IN =50%
REQUENCY =10 RAD/SEC

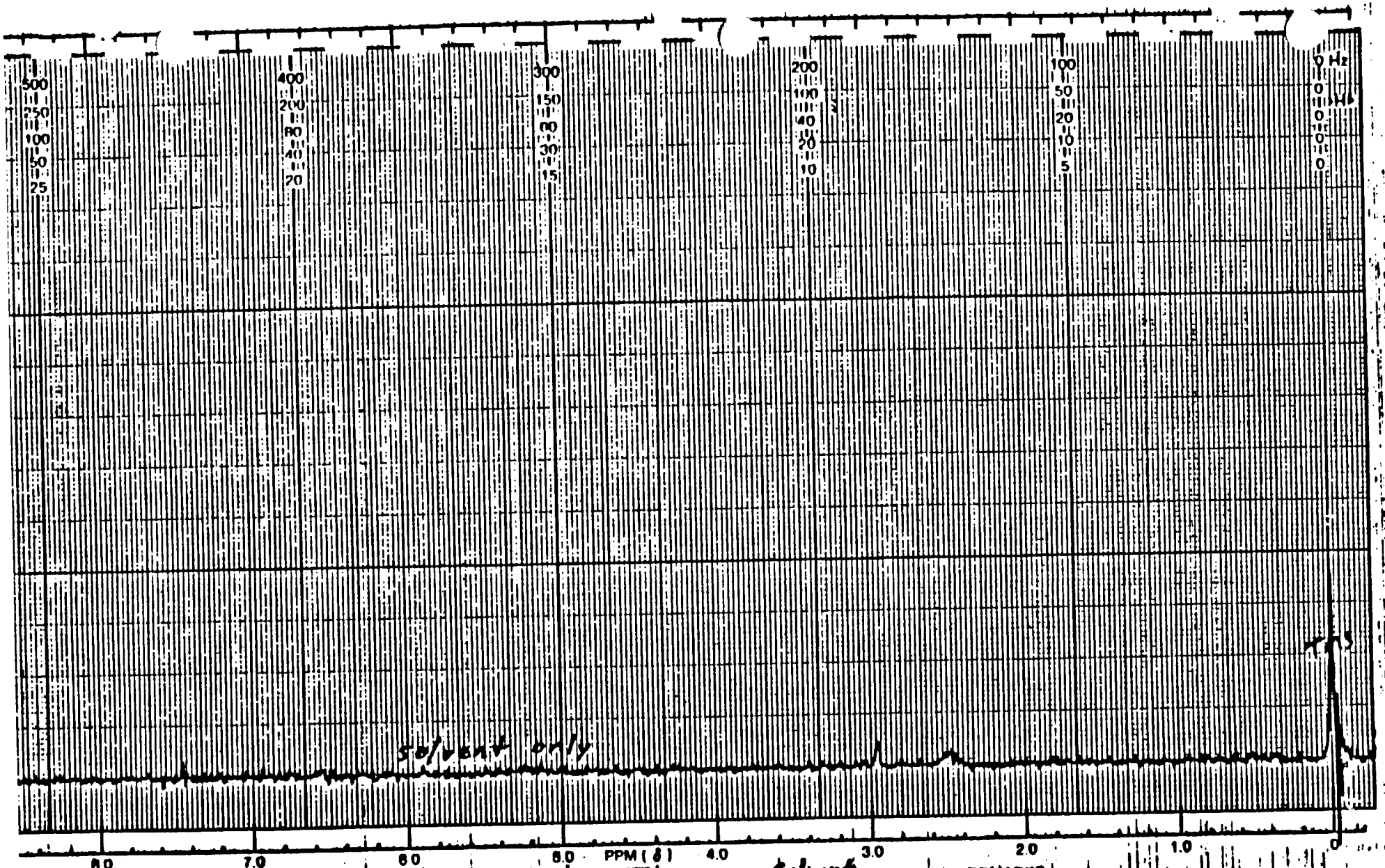
NASA FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT1-2

N.J.	ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
1	4.660e+003	4.659e+003	9.050e+001	5.983e+002	2.000e-001	3.000e+001
2	4.371e+003	4.371e+003	6.108e+001	5.612e+002	1.000e+000	3.100e+001
3	3.598e+003	3.598e+003	5.110e+001	4.600e+002	2.000e+000	3.300e+001
4	2.798e+003	2.797e+003	3.594e+001	3.569e+002	3.000e+000	3.500e+001
5	2.107e+003	2.107e+003	3.108e+001	2.679e+002	4.000e+000	3.700e+001
6	1.583e+003	1.583e+003	3.224e+001	2.006e+002	5.000e+000	3.900e+001
7	1.190e+003	1.190e+003	3.339e+001	1.505e+002	6.000e+000	4.100e+001
8	8.865e+002	8.859e+002	3.148e+001	1.118e+002	7.000e+000	4.300e+001
9	6.653e+002	6.647e+002	2.780e+001	8.385e+001	8.000e+000	4.400e+001
10	5.079e+002	5.071e+002	2.798e+001	6.388e+001	9.000e+000	4.600e+001
11	3.852e+002	3.844e+002	2.502e+001	4.841e+001	1.000e+001	4.800e+001
12	2.984e+002	2.975e+002	2.327e+001	3.747e+001	1.100e+001	5.000e+001
13	2.342e+002	2.331e+002	2.289e+001	2.939e+001	1.200e+001	5.200e+001
14	1.840e+002	1.827e+002	2.245e+001	2.308e+001	1.300e+001	5.400e+001
15	1.473e+002	1.458e+002	2.082e+001	1.848e+001	1.400e+001	5.600e+001
16	1.183e+002	1.167e+002	1.911e+001	1.484e+001	1.500e+001	5.800e+001
17	9.661e+001	9.513e+001	1.683e+001	1.211e+001	1.600e+001	6.000e+001
18	7.932e+001	7.792e+001	1.482e+001	9.949e+000	1.700e+001	6.200e+001
19	6.663e+001	6.543e+001	1.260e+001	8.349e+000	1.800e+001	6.400e+001
20	5.676e+001	5.578e+001	1.050e+001	7.120e+000	1.900e+001	6.600e+001
21	4.854e+001	4.761e+001	9.465e+000	6.078e+000	2.000e+001	6.800e+001
22	4.177e+001	4.119e+001	6.924e+000	5.237e+000	2.100e+001	7.000e+001
23	3.651e+001	3.587e+001	6.826e+000	4.579e+000	2.200e+001	7.200e+001
24	3.142e+001	3.086e+001	5.898e+000	3.941e+000	2.300e+001	7.400e+001
25	2.703e+001	2.655e+001	5.087e+000	3.392e+000	2.400e+001	7.600e+001
26	2.308e+001	2.266e+001	4.377e+000	2.874e+000	2.500e+001	7.800e+001

27	2.043e+001	2.006e+001	3.877e+000	2.564e+000	2.600e+001	8.100e+001
28	1.849e+001	1.810e+001	3.730e+000	2.317e+000	2.700e+001	8.300e+001
29	1.622e+001	1.590e+001	3.207e+000	2.036e+000	2.800e+001	8.500e+001
30	1.393e+001	1.366e+001	2.742e+000	1.747e+000	2.900e+001	8.700e+001
31	1.222e+001	1.199e+001	2.329e+000	1.533e+000	3.000e+001	8.900e+001
3	1.063e+001	1.038e+001	2.294e+000	1.332e+000	3.100e+001	9.100e+001
3	9.435e+000	9.306e+000	1.554e+000	1.183e+000	3.200e+001	9.300e+001
34	7.880e+000	7.823e+000	9.476e-001	9.897e-001	3.300e+001	9.500e+001
35	6.772e+000	6.706e+000	9.418e-001	8.497e-001	3.400e+001	9.700e+001
36	5.496e+000	5.459e+000	6.397e-001	6.900e-001	3.500e+001	9.900e+001
37	4.882e+000	4.861e+000	4.551e-001	6.127e-001	3.600e+001	1.010e+002
38	4.092e+000	4.089e+000	1.699e-001	5.140e-001	3.700e+001	1.030e+002
39	3.417e+000	3.417e+000	0.000e+000	4.292e-001	3.800e+001	1.050e+002
40	2.973e+000	2.954e+000	3.373e-001	3.735e-001	3.900e+001	1.070e+002
41	2.570e+000	2.529e+000	4.913e-001	3.727e-001	4.000e+001	1.090e+002
42	3.516e+000	3.200e+000	1.458e+000	4.412e-001	4.100e+001	1.110e+002
43	4.011e+000	3.256e+000	2.343e+000	5.040e-001	4.200e+001	1.130e+002
44	3.159e+000	2.754e+000	1.547e+000	3.966e-001	4.300e+001	1.150e+002
45	3.304e+000	2.921e+000	1.544e+000	4.144e-001	4.400e+001	1.170e+002
46	2.910e+000	2.125e+000	1.988e+000	3.649e-001	4.500e+001	1.190e+002
47	2.898e+000	2.125e+000	1.971e+000	3.637e-001	4.600e+001	1.210e+002
48	3.698e+000	2.828e+000	2.383e+000	4.639e-001	4.700e+001	1.230e+002
49	4.482e+000	3.486e+000	2.817e+000	5.620e-001	4.800e+001	1.250e+002
50	5.299e+000	4.021e+000	3.451e+000	6.639e-001	4.900e+001	1.250e+002

ISP FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT1-2

NO.	ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
51	5.075e+000	4.159e+000	2.908e+000	6.364e-001	5.000e+001	1.270e+002
52	4.836e+000	3.218e+000	3.610e+000	6.067e-001	5.100e+001	1.290e+002
53	6.447e+000	5.135e+000	3.898e+000	8.098e-001	5.200e+001	1.310e+002
54	1.123e+001	9.521e+000	5.956e+000	1.411e+000	5.300e+001	1.330e+002
55	1.413e+001	1.201e+001	7.434e+000	1.773e+000	5.400e+001	1.350e+002



MANUAL AUTO ☐

WEEP OFFSET (Hz): 0
PECTRUM AMPLITUDE: 8.0
NTEGRAL AMPLITUDE: —
PINNING RATE (RPS): 30

SWEEP TIME (SEC): 30 [75] 300 1000
SWEEP WIDTH (Hz): 25 50 100 250 [500]
FILTER: 1 2 3 4 5 6 7 8
RF POWER LEVEL: 0.30

(250)
(500)
(2)
(.05)

SAMPLE: Solvent
SOLVENT: Unisol-d + 0.82%TMS
DEC. LEVEL

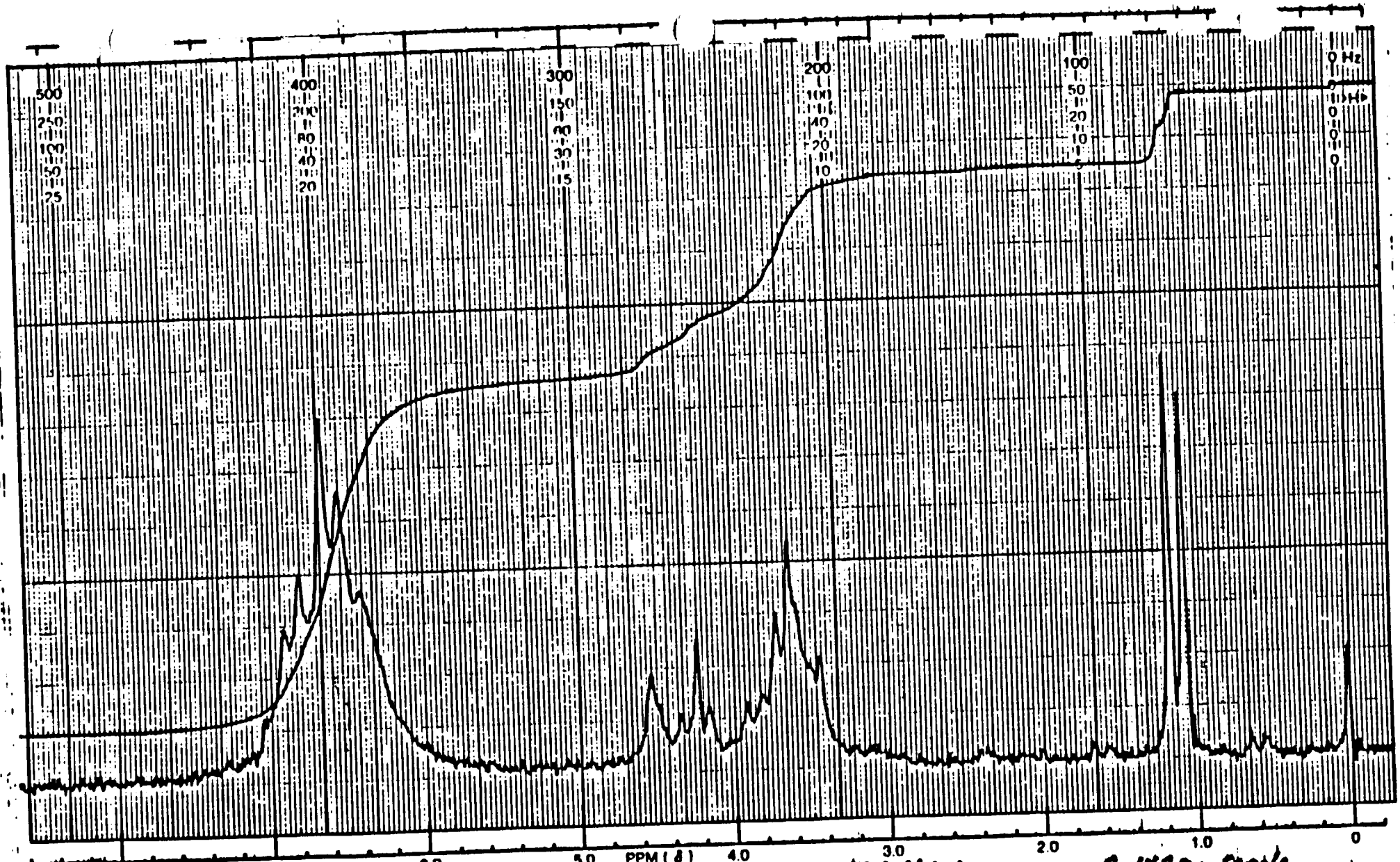
REMARKS:

DATE: 3-21-86
OPERATOR DGW
SPECTRUM NO. 1A of 7
solvent scan

NORELL, INC.
LANDISVILLE, N.J. 08328
Phone: (609) 697-0020

r60

ORIGINAL PAGE IS
OF POOR QUALITY



SWEEP OFFSET (Hz): 0
SPECTRUM AMPLITUDE: 1.0
INTEGRAL AMPLITUDE: 5.0
SPINNING RATE (RPS): 30

MANUAL
SWEEP TIME (SEC): 50 100 500 1000
SWEEP WIDTH (Hz): 25 50 100 250 500
FILTER: 1 2 3 4 5 6 7 8
RF POWER LEVEL: 0.25

AUTO ☐
(250)
(500)
(2)
(.05)

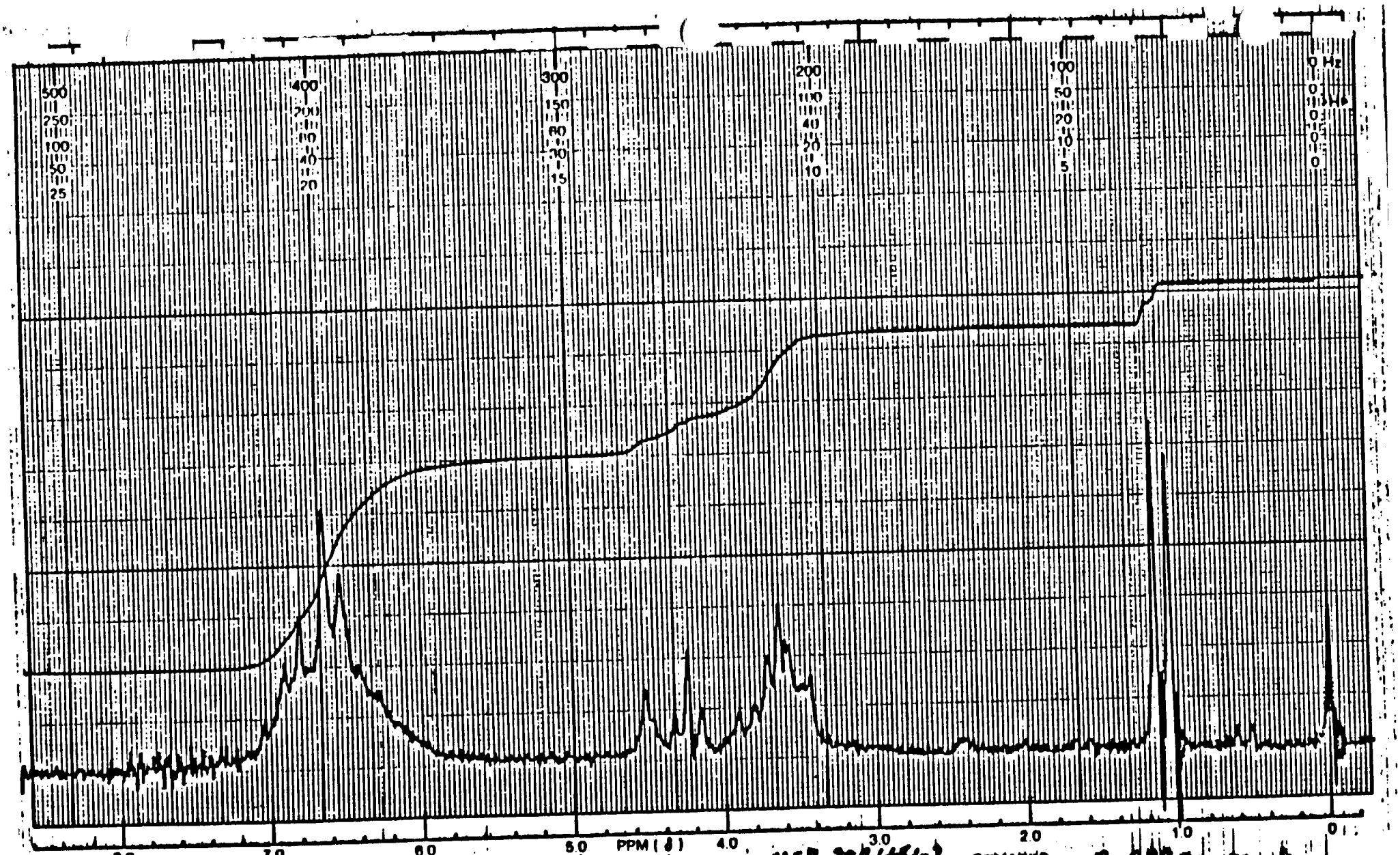
SAMPLE: USP-394 Lot 1-1
SOLVENT: Anisol-d + 0.5% TMS
DEC. LEVEL

REMARKS: 0.140 gm sample
0.698 gm solvent

DATE: 3-21-96
OPERATOR DGW
SPECTRUM NO. 1 of 7 USP-394 LC #1-1

CHART 15A

NORELL, INC.
LANDISVILLE, N.J. 08326
T60 Phone: (609) 697-0020



SWEEP OFFSET (Hz): 0
SPECTRUM AMPLITUDE: 8.0
INTEGRAL AMPLITUDE: 5.0
SPINNING RATE (RPS): 20

MANUAL
SWEEP TIME (SEC): 50 250 500 1000
SWEEP WIDTH (Hz): 25 50 100 250 500
FILTER: 1 2 3 4 5 6 7 8
RF POWER LEVEL: 0.25

AUTO ☐
(250)
(500)
(2)
(.05)

SAMPLE: USP-39A Lot#1-2
SOLVENT: Uniid-d + 0.5% TMS
DEC. LEVEL

REMARKS: 0.044 gm sample
0.817 gm solvent

DATE: 3-21-96
OPERATOR DGW
SPECTRUM NO. 2 of 3 USP-39A Lot#1-2

NORELL, INC.
LANDISVILLE, N.J. 08326
T60 Phone: (609) 697-0020

ORIGINAL PAGE IS OF POOR QUALITY

CHART 15B

TABLE OF CONTENTS

FABRIC TESTING

NAS8-36298

U.S. Polymeric D.E. 71108

WCA Fabric for NASA Lot# 1 (KAISER)

CHARTS

U.S. Polymeric

FABRIC TESTING

NAS8-36298

U.S. POLYMERIC O.E. 71108

WCA Fabric for NASA Lot# 1 (KAISER)

1a. Breaking Strength, lbs/in, WARP
ASTM D1682

	#1-2E
PICK	77
CENTER	70
PLAIN	70
AVG.	72.3

1b. Breaking Strength, lbs/in, FILL
ASTMD 1682

PICK	23
CENTER	22
PLAIN	24
AVG.	23.3

2a. Carbon Assay, %
MDQAI 5560

PICK	99.9
CENTER	99.9
PLAIN	99.4
AVG.	99.73

2b. Hydrogen Assay, %
MDQAI 5560

PICK	<.01
CENTER	<.01
PLAIN	<.01
AVG.	EST .001

2c. Nitrogen Assay, %
MDQAI 5560

PICK	.10
CENTER	.10
PLAIN	.10
AVG.	.10

3. Visual Inspection
QCi-102 — See Chart 3B

4. Specific Gravity, Units
PTM-84

	1.7139
	1.7196
	1.7239
AVG.	1.719

5. pH, Units
CTM-24B

	6.5
	6.5
AVG.	6.5

HITCO MATERIALS DIVISION
700 E. DYER ROAD, SANTA ANA, CALIFORNIA 92707 • (714) 549-1101 • TWX (910) 595-1130 • FAX # (714) 549-2858-5-2437

WCA Fabric for NASA Lot# 1 (KAISER)

6. TGA, °C at 50% Weight Loss
CTM-51 (AIR)

SET UP# 2
#1-2E 859

See Chart 6A

7a. Atomic Absorption, ppm
CTM-53B

	#1-2E
Na	25
K	1
Ca	7
Mg	1
Li	0
AVG.	34

7b. Moisture Content, %
CTM-53B

.035

7c. Ash Content, %
CTM-53

.010

8a. Filament diameter, microns, WARP
S.E.M. (Diameters are an average of 10 measurements)

AVERAGE	11.72
Minimum	9.55
Maximum	15.55
Std. Dev	1.78

9a. Thread Count, per inch, WARP
PTM-5A

#1-2E
29
29
29
29
29
AVG. 29.0

9b. Thread Count, per inch, FILL
PTM-5A

22
22
22
22
22
AVG. 22.0

10a. Areal Weight as received, gm/4x4
PTM-3A

LEFT	2.575
CENTER	2.549
RIGHT	2.561
AVG.	2.562

WCA Fabric for NASA Lot# 1 (KAISER)

10b. Volatiles as received, %
PTM-3A

	#1-2E
LEFT	.43
CENTER	.43
RIGHT	.66
AVG.	.51

10c. Weight change on Acetone wash, %
PTM-3A

LEFT	.35
CENTER	-.04
RIGHT	.55
AVG.	.29

U.S. Polymeric

Hamid M. Quraishi

Hamid M. Quraishi, Manager
Quality Assurance Department

ORIGINAL PAGE IS
OF POOR QUALITY

USP NO. CHART 3B

DATE 3/17/66

FABRIC THORNEL WCA GRAPHITE CLOTH

MFG. UNION CARBIDE

ROLL NO. 850 PCS WCA-7

YARDS 180

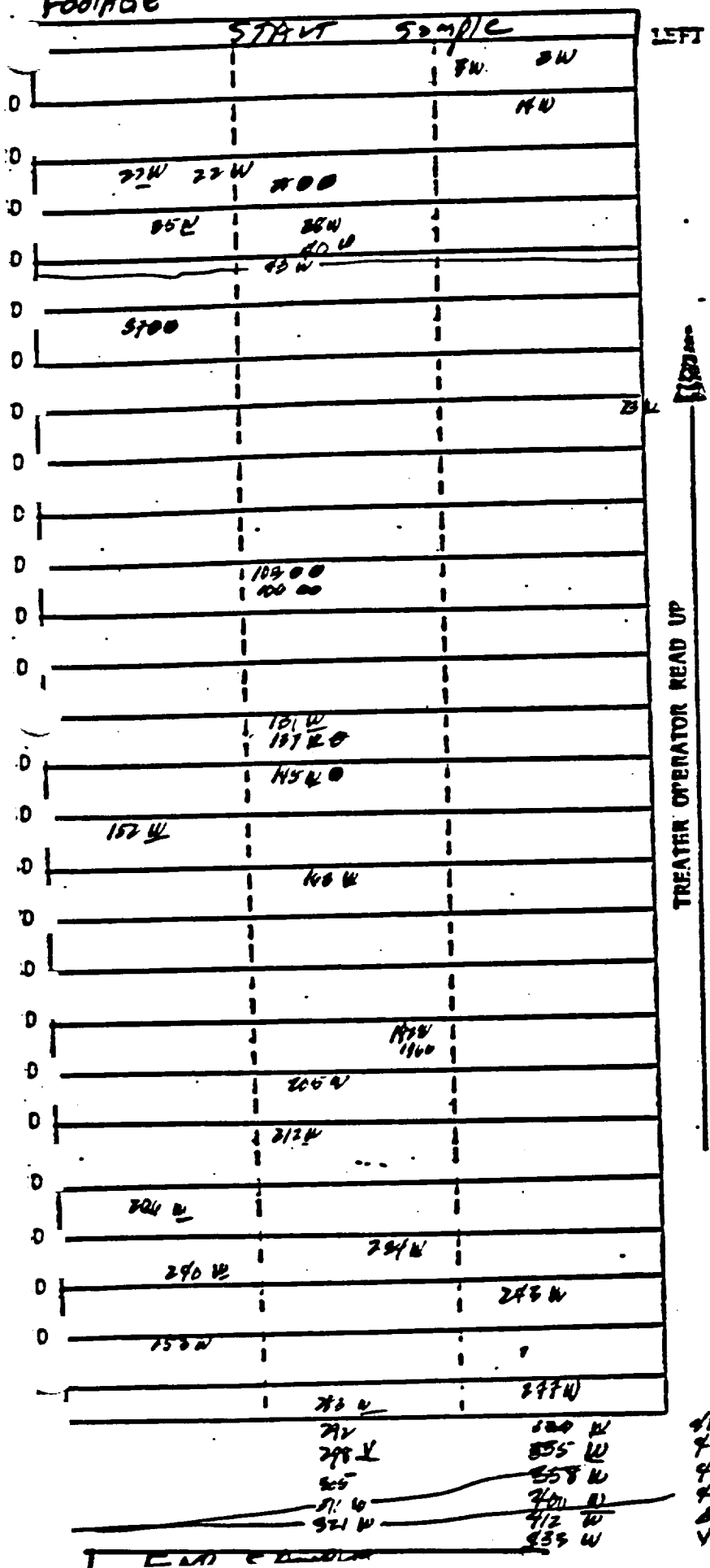
POUNDS 99

ORDER NO. OE 7/108

SPECIFICATION Union

~~Q.C. FILE~~ NASA 1-2

FOOTAGE --



SYMBOLS

- TEAR
- SPOTS OR STAINS
- FOLDS
- EDGE CURL
- TIGHT WEAVE OR SELVAGE
- WEAVE DISTORTION
- VISIBLE PUCKERS
- ONE PUCKER CREASING
- TWO OR MORE CREASINGS

REMARKS

GRADE Group C

CHART 6A

ORIGINAL PAGE IS
OF POOR QUALITY

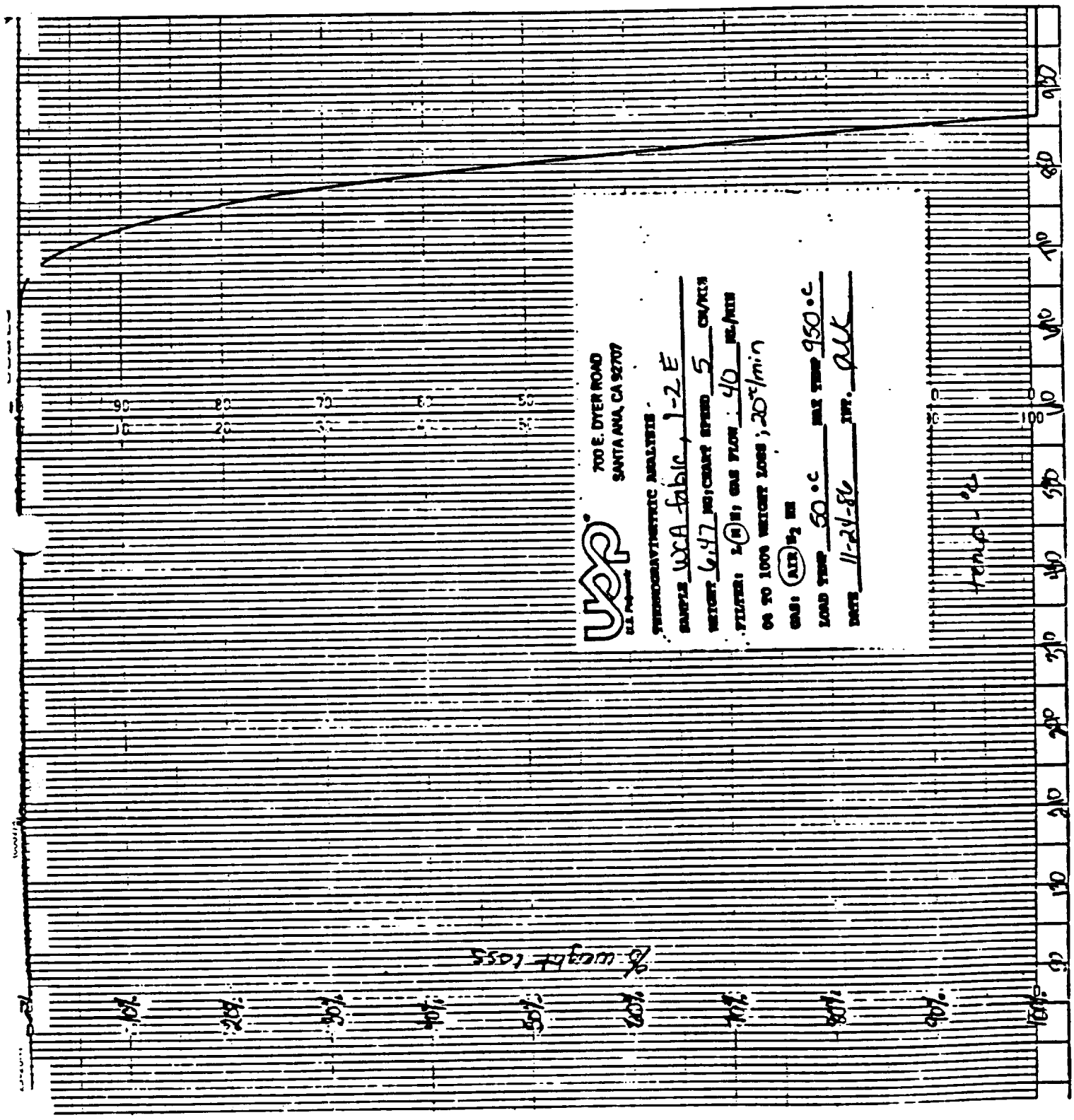


TABLE OF CONTENTS

PREPREG TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

FM 5064J NASA LOT# 1 U.S.P. LOT# C02135 (KAISER)

CHARTS

U.S. Polymeric

PREPREG TESTING

NAS8-36298

U.S. POLYMERIC O.E.71108

FM 5064J NASA LOT# 1 U.S.P. LOT# C02135 (KAISER)

		ROLL#1-S
1a. Resin Content, Soxhlet, % CTM-6D		33.0 32.1 32.8
	AVG.	32.6
1b. Filler Content, Soxhlet, % CTM-6D		13.5 13.2 13.5
	AVG.	13.4
1c. Cloth Content, Soxhlet, % CTM-6D		53.5 54.7 53.7
	AVG.	54.0
2. Volatile Content, % PTM-17B		2.5 2.3 2.0
	AVG.	2.3
3. Flow, 1000 psi, % PTM-19G		13.9 14.2 13.6
	AVG.	13.9
4. Resin Content, Dry basis, % PTM-16F, Type II		34.4 34.0 34.8
	AVG.	34.4
5. Tack, lbs PTM-80		26
6. Gel Time, seconds PTM-20E		34
7a. Atomic Absorption, ppm CTM-53B	Na	1
	K	0
	Ca	0
	Mg	3
	Li	0
	TOTAL	4
7b. Moisture Content, % CTM-53B		1.76

HITCO MATERIALS DIVISION
700 E. DYER ROAD, SANTA ANA, CALIFORNIA 92707 • (714) 549-1101 • TWX (910) 595-1130 • FAX # (714) 549-2858-5-2437

FM 5064J NASA LOT# 1 U.S.P. LOT# C02135 (KAISER)

			ROLL#1-S
7c. Ash Content, % CTM-53B			.16
8. TGA, % Weight Loss at 500°C CTM-51 (Nitrogen)	See Chart 8A		8.9
9. DSC, °C CTM-50A	First Temp See Chart 9A		182
10. Infrared (IRZB) Baseline CTM-21C	See Chart 10A		.82
11. Environmental History	Date manufactured: 1 May 1986 Packaged in: MIL-B-131 Class I bag supported in cardboard carton Date shipped: 16 June 1986 in 40°F truck		
12. Specific Gravity, Cured, Units ASTM D792			1.429 1.430 1.430
		AVG.	1.429
13a. Tensile Strength, ksi, WARP FTMS 406-1011			20.89 20.75 20.00 20.68 20.75
		AVG.	20.61
13b. Tensile Modulus, msi, WARP FTMS 406-1011			1.98 1.95 1.87 2.02 1.99
		AVG.	1.96
13c. Tensile Elongation, %, WARP FTMS 406-1011			1.44 1.49 1.47 1.49 --
		AVG.	1.47
14a. Flexural Strength, ksi, WARP FTMS 406-1031			27.43 28.15 29.32 30.28 27.80
		AVG.	28.60

FM 5064J NASA LOT# 1 U.S.P. LOT# C02135 (KAISER)

		ROLL#1-S
14b. Flexural Modulus, msi, WARP FTMS 406-1031		1.68
		1.75
		1.88
		1.72
		1.69
	AVG.	1.74
15a. Compressive Strength, ksi, WARP FTMS 406-1021		11.17
		15.10
		14.52
		12.76
		18.04
	AVG.	14.32
15b. Compressive Modulus, msi, WARP FTMS 406-1021		2.62
		2.51
		2.53
		2.31
		2.57
	AVG.	2.51
16. Double Shear Strength, ksi FTMS 406-1041A		2.61
		2.68
		2.56
		2.70
		2.68
	AVG.	2.64
17. Barcol Hardness, Units ASTM D-2583 (Average of 10 determinations)		61.5
18. Residual Volatiles, % PTM-98		.99
		.97
		1.16
	AVG.	1.04
19. Resin Content, Pyrolysis, % CTM-14B		31.32
		30.52
		31.61
	AVG.	31.15
20. Acetone Extraction, % CTM-18A		5.00
		5.12
		5.76
	AVG.	5.29
21a. CTE, in/in °F with PLY PTM-61B		3.29
		1.59
	AVG.	2.44

FM 5064J NASA LOT# 1 U.S.P. LOT# C02135 (KAISER)

21b. CTE, in/in °F Cross PLY
PTM-61B

	9.40
	8.11
AVG.	8.76

See Chart 21A

U.S. Polymeric

Hamid M. Quraishi, Manager
Quality Assurance Department

CHART 8A

ORIGINAL PAGE IS
OF POOR QUALITY

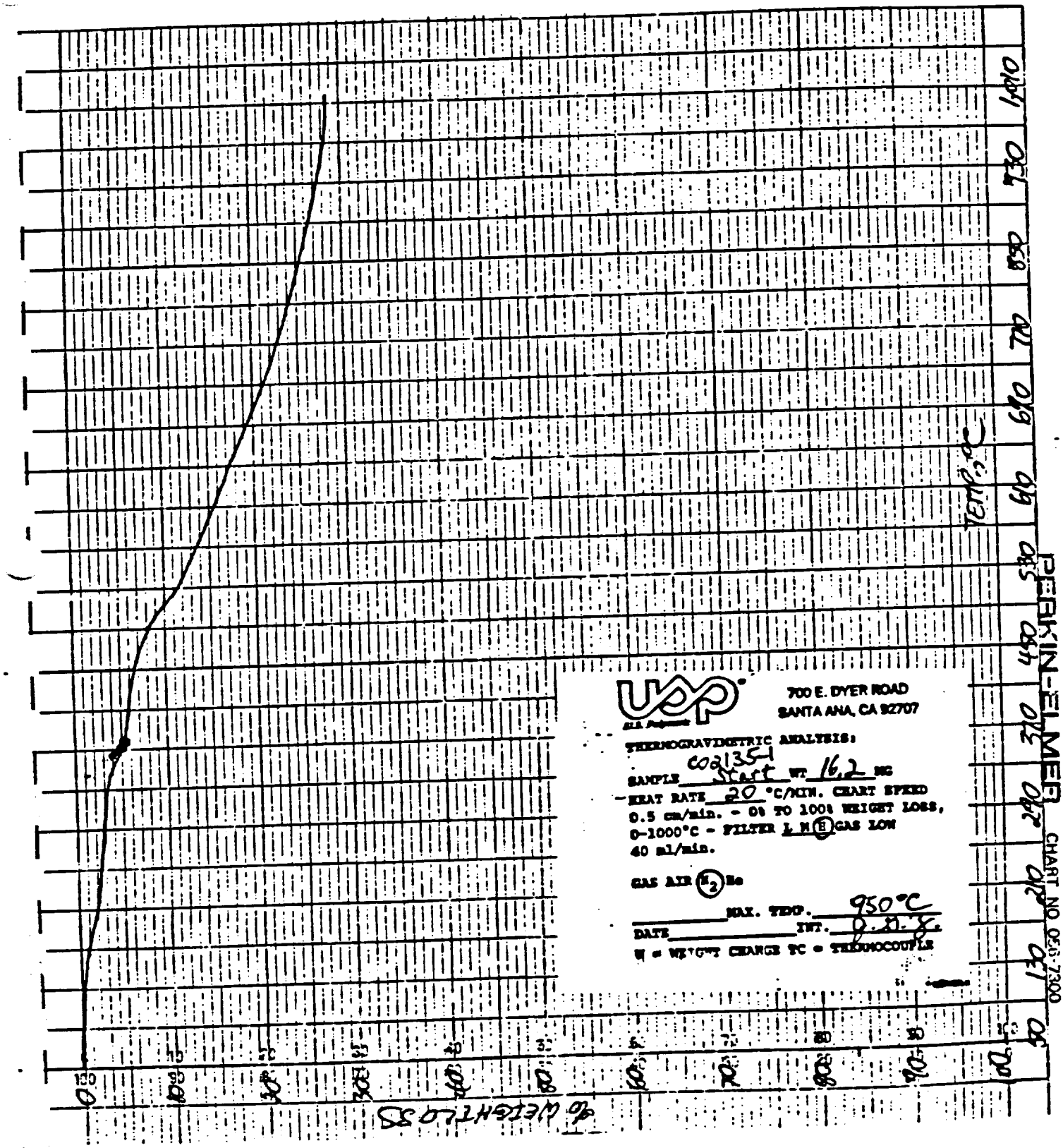
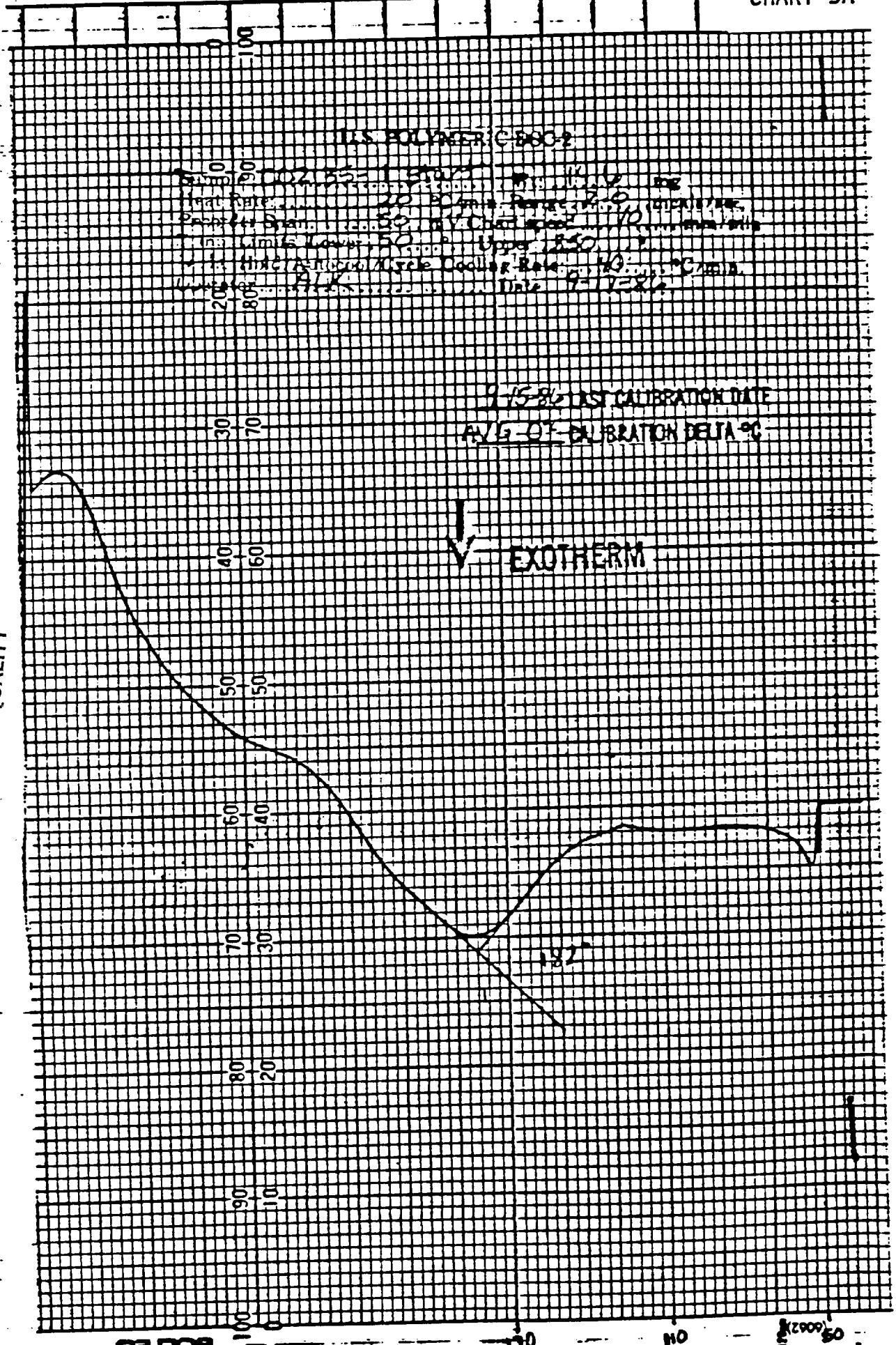


CHART 9A



SPECTRUM NO. 15185
DATE 7-07-86
SAMPLE FM 5064V
C02135 #1

SOURCE
STRUCTURE

PATH 0.2 mm NACL
SOLVENT ACETONE
CONCENTRATION 30-50%T
PHASE 3
COMMENTS PRE-PREG
MATERIAL

ANALYST Y. MIRANDA

Beckman®
INFRARED
SPECTROPHOTOMETER

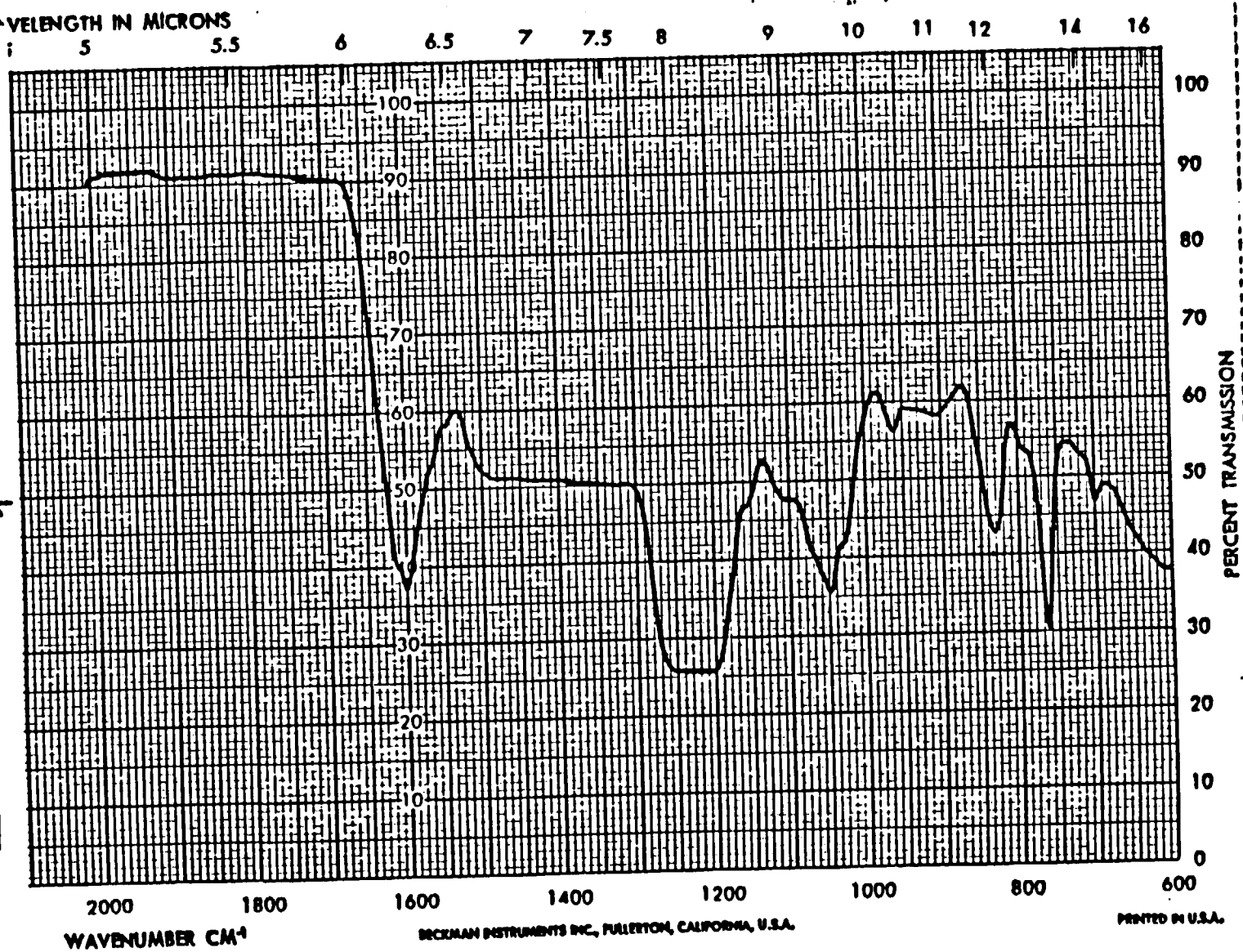
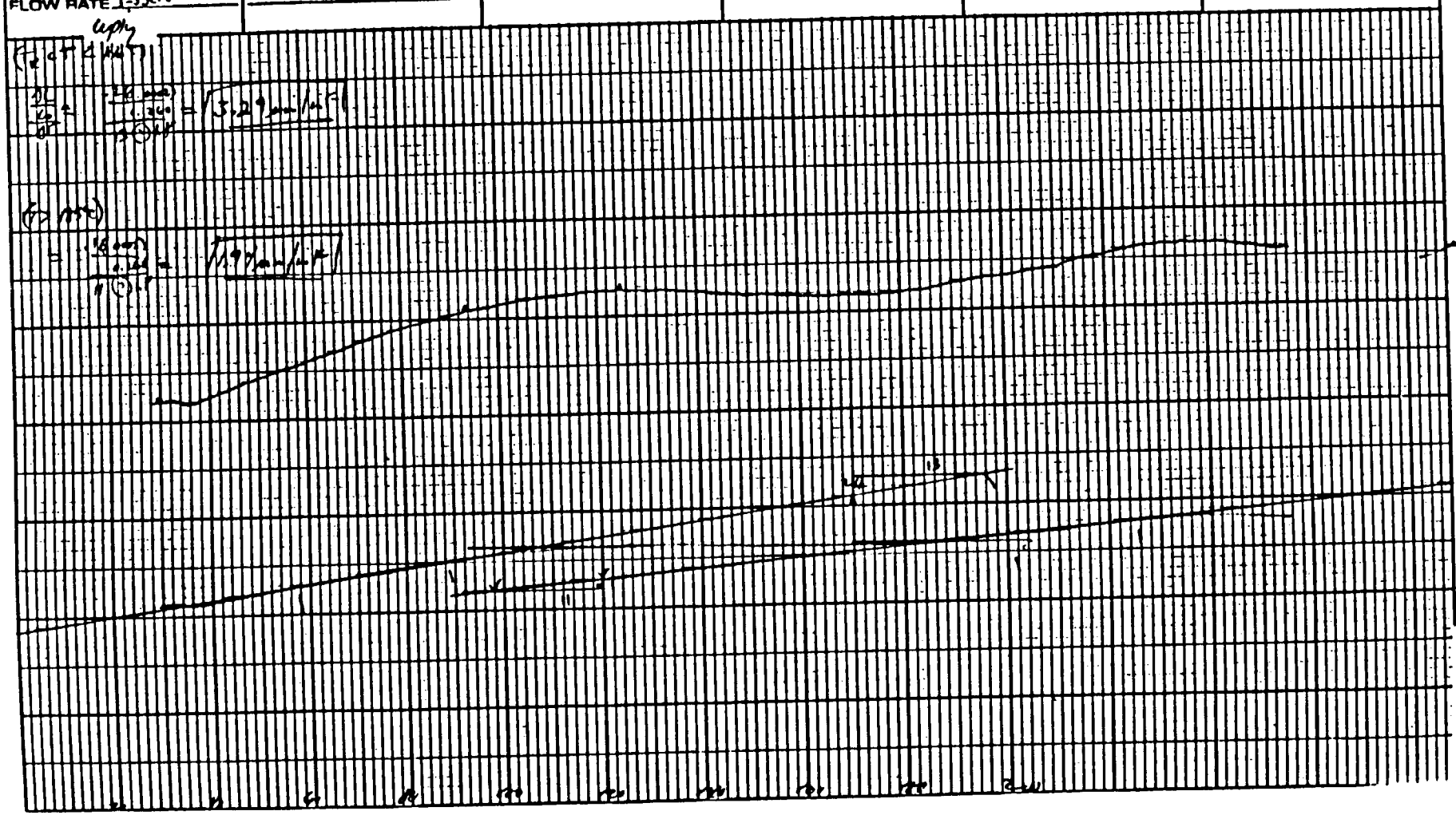


CHART 10A

ORIGINAL PAGE IS
OF POOR QUALITY

PART NO. 990088

RUN NO.___ DATE 9/22/96 OPERATOR TH SAMPLE: BD215-1-SMC-(1) ATM Air @ 30P FLOW RATE 1-5X cm	T-AXIS SCALE, °C/in 30-21 PROG. RATE, °C/min 10 HEAT ✓ COOL ___ ISO ___ SHIFT, in 0	DTA-DSC SCALE, °C/in ___ (mcal/sec)/in ___ WEIGHT, mg ___ REFERENCE ___	TGA SCALE, mg/in ___ SUPPRESSION, mg ___ WEIGHT, mg ___ TIME CONST., sec ___ dY, (mg/min) /in ___	TMA SCALE, mils/in 0.1/0.5 MODE Expansion SAMPLE SIZE 0.266 LOAD, g N dY, (10X), (mils/min) /in ___	___ ___ ___ ___ ___ ___



MEASURED VARIABLE ___ DUPONT Instruments

Chart 21A1

Chart 21A2

ORIGINAL PAGE IS
OF POOR QUALITY

PART NO. 990088

RUN NO ___ DATE 9/21/94
OPERATOR DL
SAMPLE:
Co(135)-1-Succ-(2)
ATM Air @ 5ml
FLOW RATE 1-50ml
Wgh

T-AXIS
SCALE, °C/in 50
PROG. RATE, °C/min 2
HEAT ✓ COOL 180
SHIFT, in 0

DTA-DSC
SCALE, °C/in
(mcal/sec)/in
WEIGHT, mg
REFERENCE

TGA
SCALE, mg/in
SUPPRESSION, mg
WEIGHT, mg
TIME CONST., sec
dY/dT (mg/min)/in

TMA
SCALE, mils/in 4x/1x
MODE Expanded
SAMPLE SIZE 0.250
LOAD, g 2
dY/dT (10X) (mils/min)/in

MEASURED VARIABLE

DUPONT Instruments

Chart 21A3

PART NO. 990000

RUN NO. ____ DATE 9/10/86
OPERATOR TH
SAMPLE:
Co(135-4-grmr-(4)
ATM Air @ STP
FLOW RATE 1-SCFH
Xdry

T-AXIS
SCALE, °C/in 50 10
PROG. RATE, °C/min 10
HEAT ✓ COOL 180
SHIFT, in 0

DTA-DSC
SCALE, °C/in
(mcal/sec)/in
WEIGHT, mg
REFERENCE

TGA
SCALE, mg/in
SUPPRESSION, mg
WEIGHT, mg
TIME CONST., sec.
dY, (mg/min)/in

TMA
SCALE, mils/in 0.1/0.2
MODE Expansion
SAMPLE SIZE 0.139
LOAD, g 10
dY, (10X) (mils/min)/in

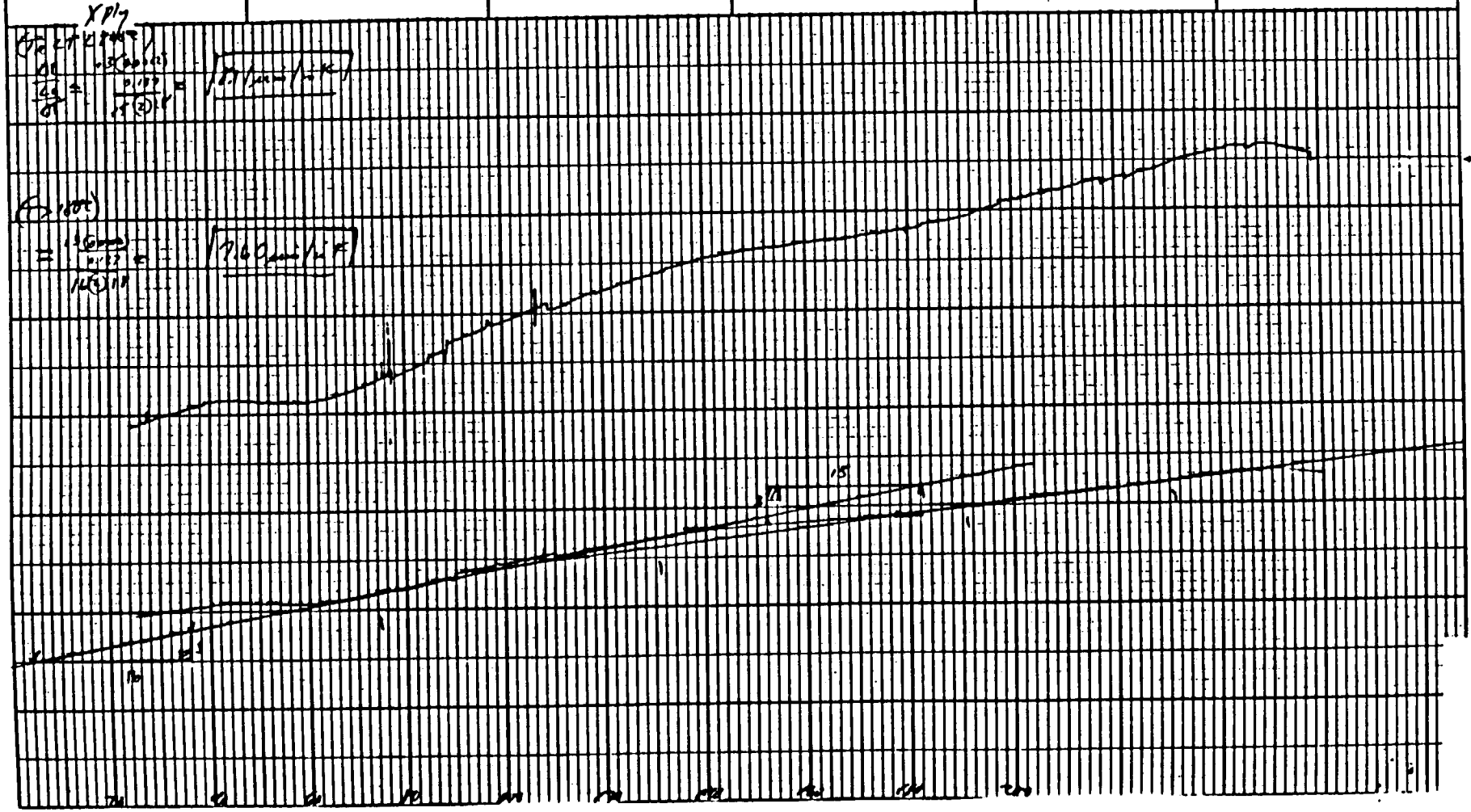
MEASURED VARIABLES

DUPONT instruments

PART NO. 990088

RUN NO.___ DATE 9/19/84	T-AXIS	DTA-DSC	TGA	TMA	
OPERATOR TH	SCALE, °C/in 50 20	SCALE, °C/in	SCALE, mg/in	SCALE, mils/in 0.1/0.2	
SAMPLE:	PROG. RATE, °C/min 15	(mcal/sec)/in	SUPPRESSION, mg	MODE Expansion	
Co2135-1-Smart-(5)	HEAT ✓ COOL 180	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE 0.137	
ATM Air @ 50	SHIFT, in 0	REFERENCE	TIME CONST., sec	LOAD, g 0	
FLOW RATE 3:5 x 11			dY, (mg/min) /in	dY, (10X), (mils/min) /in	

XPly



DUPONT Instruments

MEASURED VARIABLE

TABLE OF CONTENTS

FILLER TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

Filler Lot for NASA Lot# 2

CHARTS

U.S. Polymeric

FILLER TESTING

NAS8-36298

U.S. POLYMERIC O.E. 71108

Filler Lot for NASA Lot# 2

1. Carbon Content, %
   QAI-5560

	SAMPLE #2A-1	#2A-2	#2A-3
	99.31	99.18	99.40
NASA LOT# 2 AVERAGE			99.30

2. Ash Content, %
   PTM-71B

	0.0	0.0	0.0
	0.0	0.0	0.0
AVG.	0.0	0.0	0.0
NASA LOT# 2 AVERAGE			0.0

3. Atomic Absorption, ppm
   CTM-53B
   (Values are average of 2 determinations)

	#2A-1	#2A-2	#2A-3	LOT#2 AVG.
Na	7.0	7.5	9.0	7.8
K	1.5	1.0	2.5	1.7
Ca	2.5	1.5	2.0	2.0
Mg	0.0	0.0	0.0	0.0
Li	0.0	0.0	0.0	0.0
TOTAL	11.0	10.0	13.5	11.5

3a. Moisture Content, %
   CTM-53B

	.041	.034	.039
	.031	.020	.045
AVG.	.036	.027	.042
NASA LOT# 2 AVERAGE			.035

3b. Ash Content, %
   CTM-53B

	0.005	0.000	0.015
	0.000	0.025	0.000
AVG.	0.003	0.013	0.008
NASA LOT# 2 AVERAGE			0.008

4. pH, Units
   ASTM D1512

	4.60	4.40	4.50
	4.60	4.60	4.70
AVG.	4.60	4.50	4.60
NASA LOT# 2 AVERAGE			4.57

5. Particle Size, microns
   S.E.M. procedure
   (Average values are of 20 determinations)

AVG.	.56	.57	.52
Maximum	.90	1.25	1.17
Minimum	.23	.20	.25
Std. Dev	.22	.28	.24
NASA LOT# 2 AVERAGE SIZE			.55

6a. TGA, °C at 50% Loss
   CTM-51

	842	850	857
NASA LOT# 2 AVERAGE			850

HITCO MATERIALS DIVISION
700 E. DYER ROAD, SANTA ANA, CALIFORNIA 92707 • (714) 549-1101 • TWX (910) 595-1130 • FAX # (714) 549-2858-5-2437

Filler Lot for NASA Lot# 2

6b. TGA
CTM-51

See Charts 6A-6C

7. Particle Size Distribution
CTM-72

See Charts 7A-7C

7a. Particle Size, microns
CTM-72

	#2A-1	#2A-2	#2A-3
	.86	.97	.95
	.85	1.08	.92
AVG.	.86	1.02	.94

NASA LOT# 2 AVERAGE .94

U.S. Polymeric

Hamid M. Quraishi

Hamid M. Quraishi, Manager
Quality Assurance Department

CHART 6A

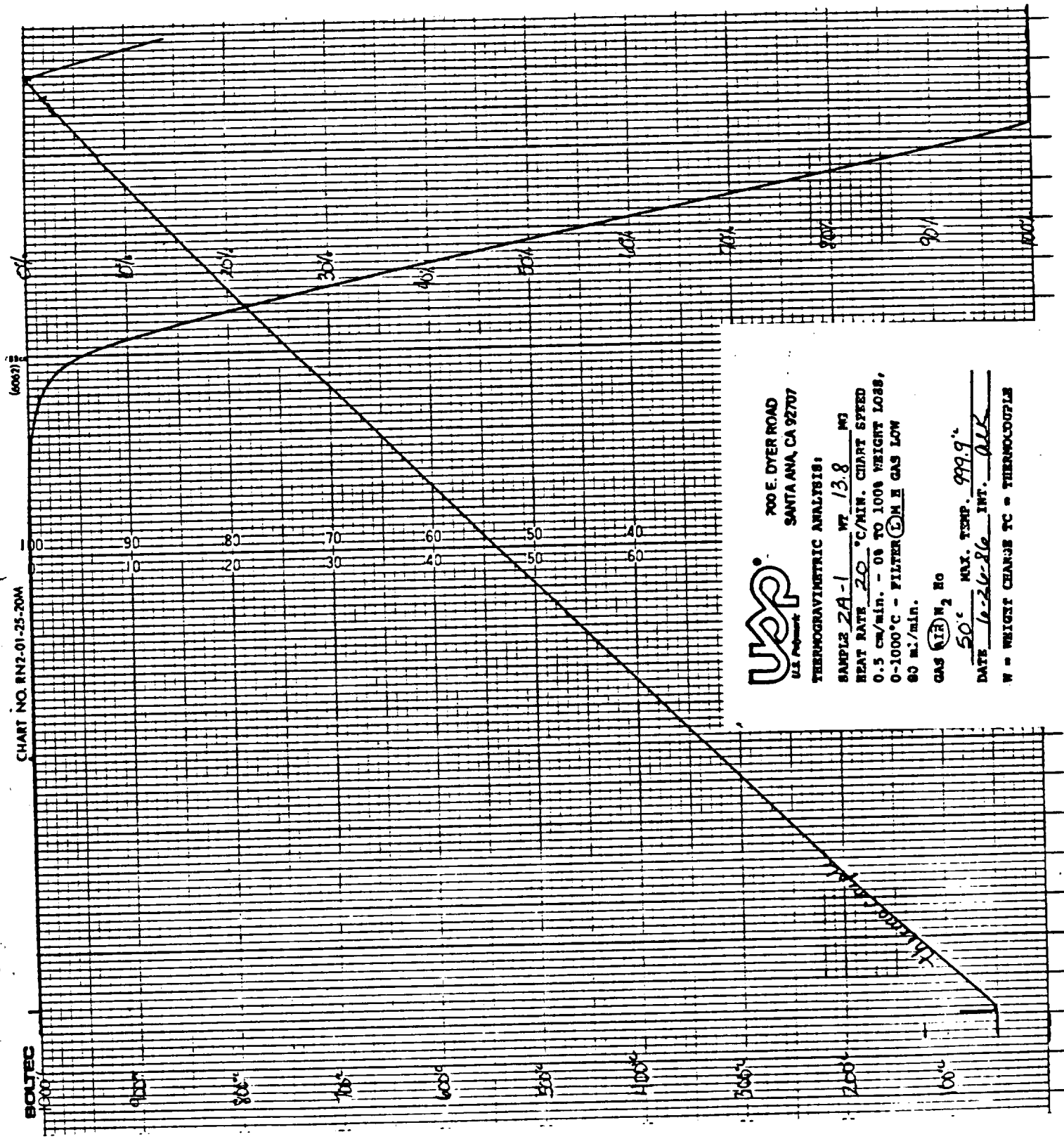


CHART 6B

ORIGINAL PAGE IS
OF POOR QUALITY

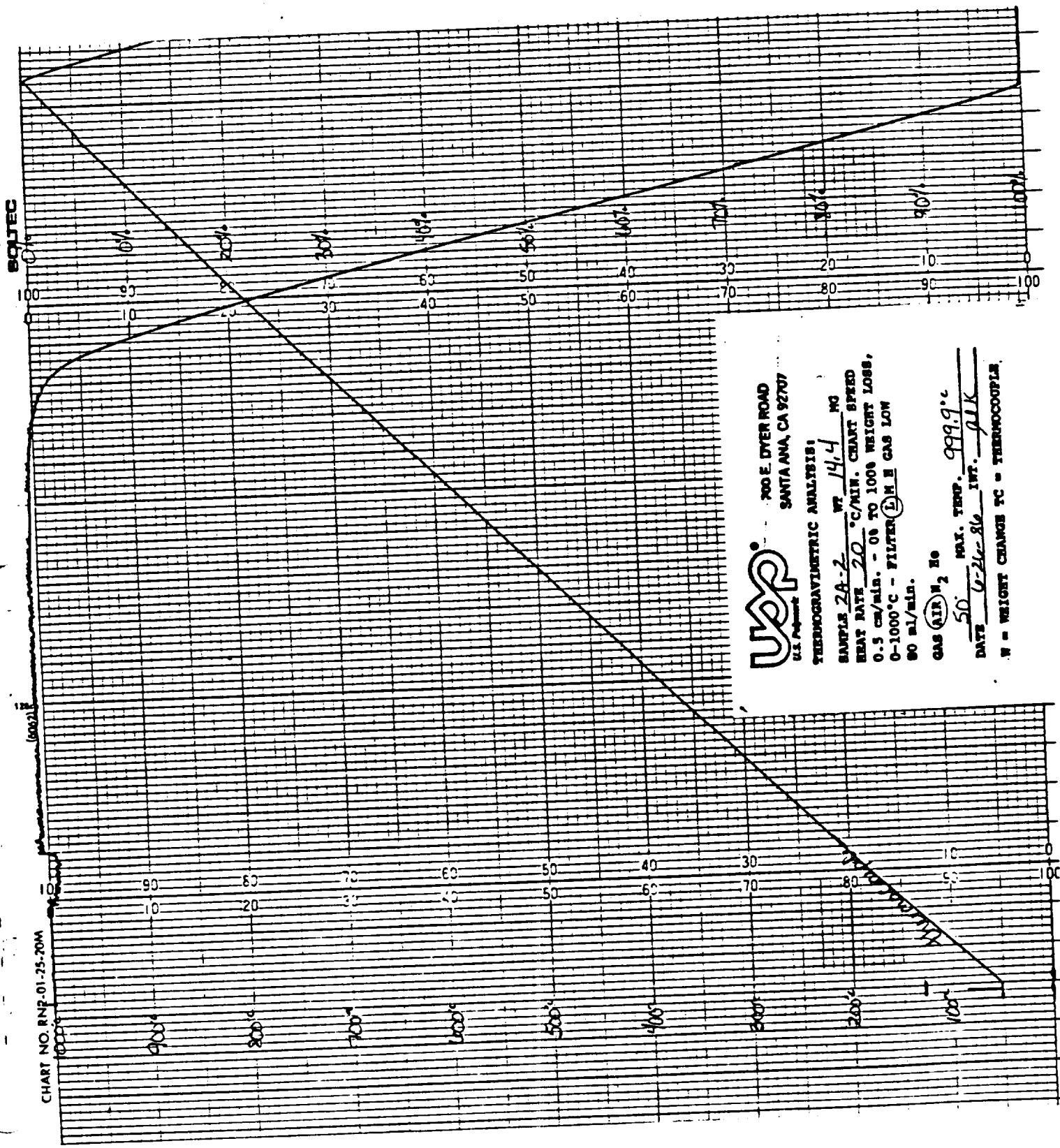
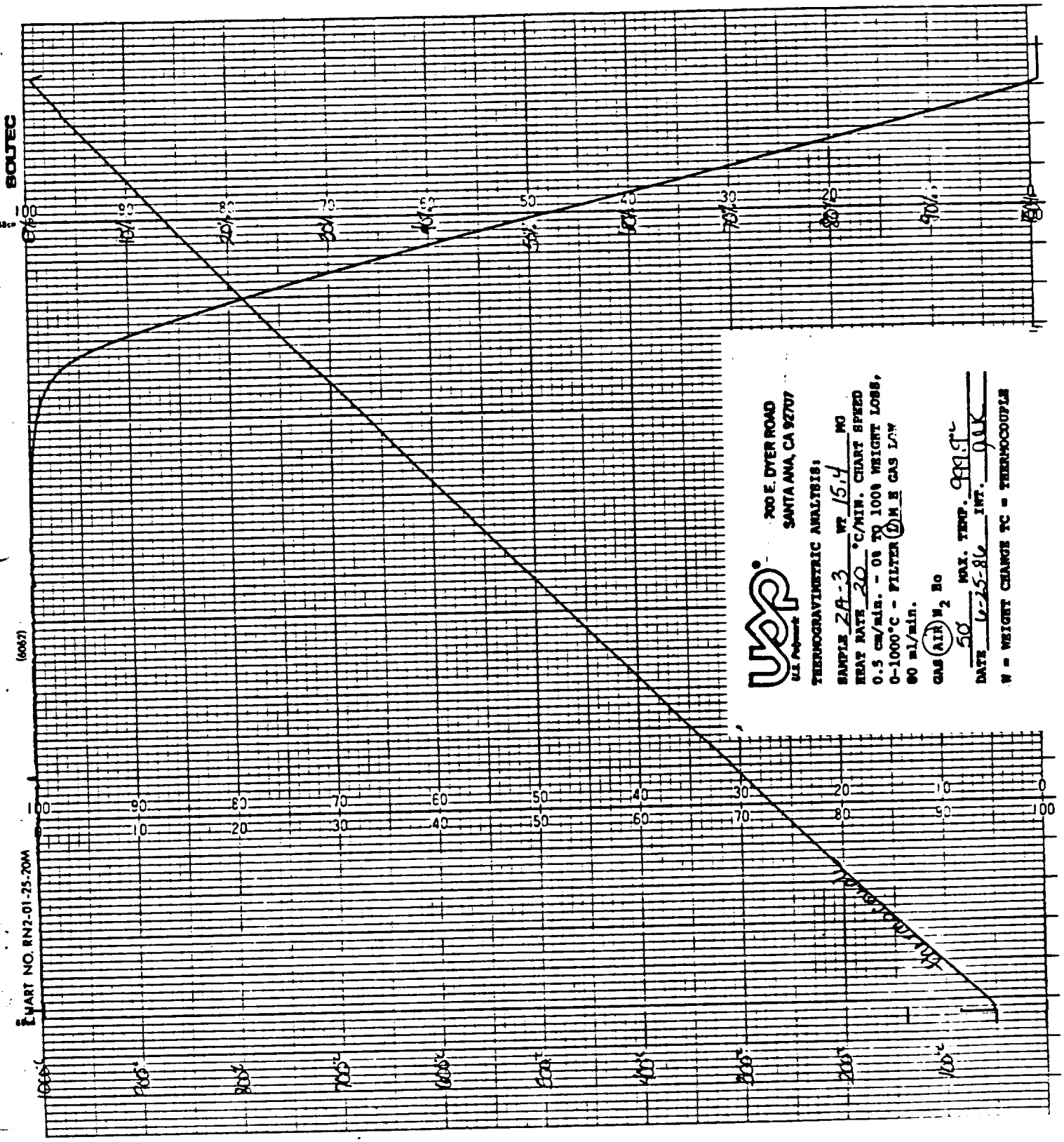


CHART 6C



HORIBA CAPA-500
PARTICLE ANALYZER

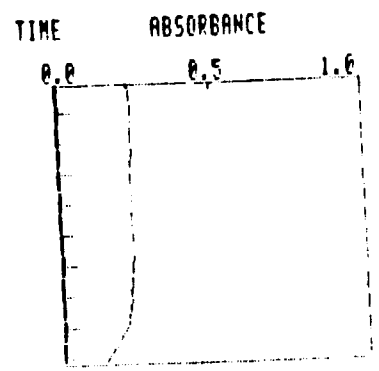
DATE 5-24-86
#1 SAMPLE NASA LOT#2A-1
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (MM)
D(MIN)	0.01(MM)
D(DIV)	0.50(MM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

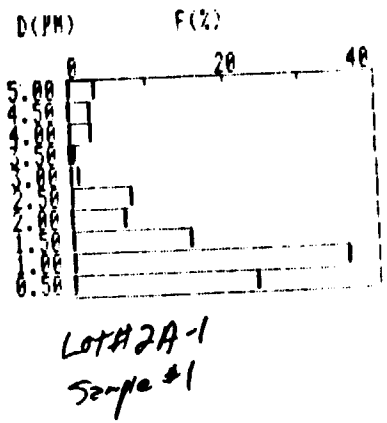


* DISTRIBUTION TABLE (BY VOL.)

D(MM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	3.3	3.3
4.50-4.00	2.6	5.9
4.00-3.50	2.7	8.7
3.50-3.00	0.5	9.2
3.00-2.50	6.9	16.0
2.50-2.00	7.8	17.8
2.00-1.50	7.0	24.7
1.50-1.00	15.2	39.9
1.00-0.50	36.1	76.0
0.50-0.00	24.0	100.0

D(AVE) 0.86 (MM)

* DISTRIBUTION GRAPH (BY VOL.)



LOT#2A-1
Sample #1

HORIBA CAPA-500
PARTICLE ANALYZER

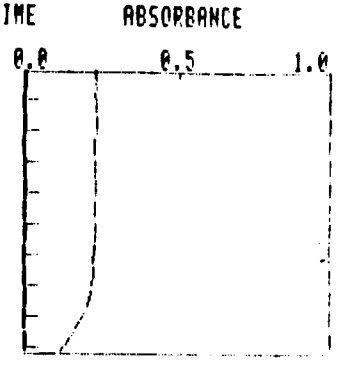
DATE 5-24-86
#2 SAMPLE NASA LOT#2A-1
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (MM)
D(MIN)	0.01(MM)
D(DIV)	0.50(MM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

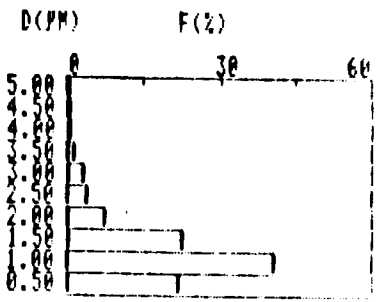


* DISTRIBUTION TABLE (BY VOL.)

D(MM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.0	0.0
4.00-3.50	0.0	0.0
3.50-3.00	1.1	1.1
3.00-2.50	3.0	4.1
2.50-2.00	3.8	7.8
2.00-1.50	7.4	15.2
1.50-1.00	22.4	37.6
1.00-0.50	40.8	78.3
0.50-0.00	21.7	100.0

D(AVE) 0.85 (MM)

* DISTRIBUTION GRAPH (BY VOL.)



LOT#2A-1
Sample#2

CHART 7A

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-24-86
#1 SAMPLE NASA LOT#2A-2
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

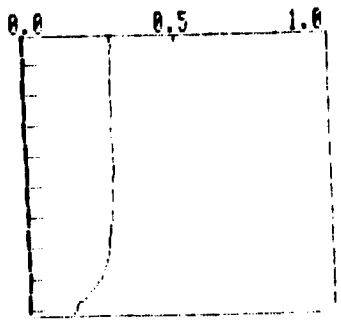
* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (PM)
D(MIN)	0.01(PM)
D(DIV)	0.50(PM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

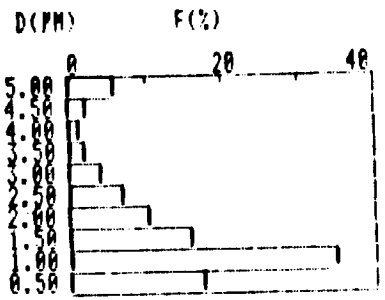


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	5.7	5.7
4.50-4.00	2.2	7.9
4.00-3.50	1.2	9.1
3.50-3.00	1.7	10.8
3.00-2.50	4.0	14.8
2.50-2.00	6.7	21.5
2.00-1.50	10.2	31.7
1.50-1.00	16.0	47.7
1.00-0.50	34.8	82.5
0.50-0.00	17.5	100.0

D(AVE) 0.97 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot#2A-2
Sample#1

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-24-86
#2 SAMPLE NASA LOT#2A-2
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

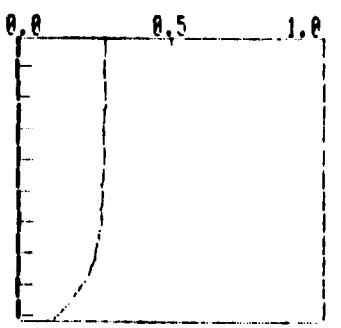
* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (PM)
D(MIN)	0.01(PM)
D(DIV)	0.50(PM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

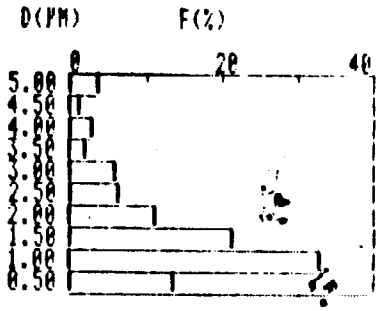


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	3.5	3.5
4.50-4.00	1.0	4.5
4.00-3.50	2.8	7.3
3.50-3.00	2.0	9.3
3.00-2.50	5.7	14.9
2.50-2.00	6.1	21.0
2.00-1.50	11.2	32.2
1.50-1.00	21.2	53.5
1.00-0.50	33.0	86.4
0.50-0.00	13.6	100.0

D(AVE) 1.08 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot#2A-2
Sample#2

CHART 7B

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-24-86
#1 SAMPLE NASA LOT#2A-3
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

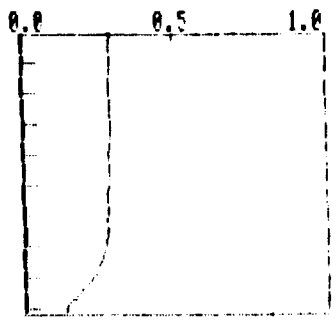
* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (PM)
D(MIN)	0.01(PM)
D(DIV)	0.50(PM)
SPEED	5000. (PPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

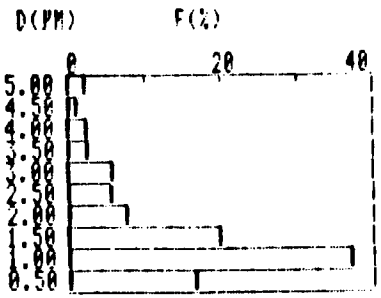


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	2.0	2.0
4.50-4.00	0.9	2.9
4.00-3.50	2.3	5.2
3.50-3.00	2.2	7.5
3.00-2.50	5.7	13.2
2.50-2.00	5.6	18.8
2.00-1.50	7.5	26.3
1.50-1.00	19.9	46.2
1.00-0.50	37.2	83.4
0.50-0.00	16.6	100.0

D(AVE) 0.95 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot#2A-3
Sample #1

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-24-86
#2 SAMPLE NASA LOT#2A-3
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

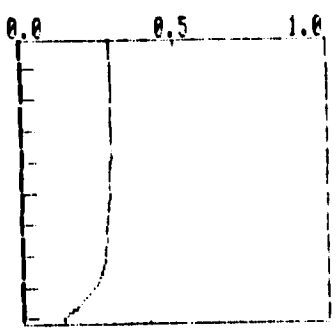
* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (PM)
D(MIN)	0.01(PM)
D(DIV)	0.50(PM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

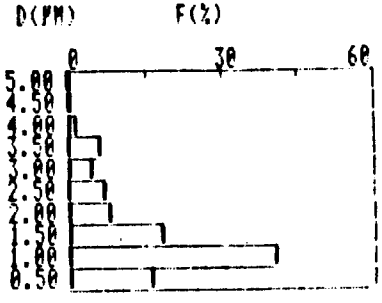


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.0	0.0
4.00-3.50	1.1	1.1
3.50-3.00	5.8	6.9
3.00-2.50	4.1	11.1
2.50-2.00	6.9	18.0
2.00-1.50	7.7	25.7
1.50-1.00	17.8	43.4
1.00-0.50	40.7	84.1
0.50-0.00	15.9	100.0

D(AVE) 0.92 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot#2A-3
Samp.#2

CHART 7C

TABLE OF CONTENTS

RESIN TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

USP-39A Resin Lot for NASA Lot# 2

CHARTS

U.S. Polymeric

RESIN TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

USP-39A Resin Lot for NASA Lot# 2

		#2-1	#2-2	
1. Resin Solids, % PTM-7C		78.8	78.7	
		78.7	79.3	
		79.1	79.6	
	AVG.	78.9	79.2	
	Lot# 2 AVERAGE		79.1	
2. Specific Gravity @ 25°C PTM-29C		1.189	1.193	
	Lot# 2 AVERAGE		1.191	
3. Viscosity, Brookfield, cps. @ 22.8°C PTM-14C		17,400	16,800	
	Lot# 2 AVERAGE		17,100	
4. Gel Time, min:sec PTM-47B		4:00	4:20	
	Lot# 2 AVERAGE		4:10	
5. Atomic Absorption, ppm CTM-53B (Values are averages of four determinations)		#2-1	#2-2	LOT2 AVG
	Na	25.0	20.8	22.9
	K	1.0	0.5	0.8
	Ca	7.5	7.0	7.3
	Mg	2.0	2.0	2.0
	Li	0.0	0.0	0.0
	AVG.	35.5	30.3	32.9
6. Volatiles, Gas Chromatography CTM-55		See Charts 6A-6B		
7. TGA, % Weight Loss at 500°C CTM-51 (AIR)		39.4	38.2	
	Lot# 2 AVERAGE		38.8	
		See Chart 7A-7B		
8. DSC, temperature °C CTM-50A		190	189	
	Lot# 2 AVERAGE		190	
		See Chart 8A-8B		
9. HPLC CTM-49A		See Chart 9A-9B		
10. GPC, Average molecular wt. CTM-49A		1800	1631	
	Lot# 2 AVERAGE		1716	
		See Chart 10A-10B		

HITCO MATERIALS DIVISION
700 E. DYER ROAD, SANTA ANA, CALIFORNIA 92707 • (714) 549-1101 • TWX (910) 595-1130 • FAX # (714) 549-2858-5-2407

USP-39A Resin Lot for NASA Lot# 2

		#2-1	#2-2
11. pH, units CTM-1B		8.4	8.5
	Lot# 2 AVERAGE		8.5
12. Phenol Content, % CTM-55 Appendix 1		13.29	13.65
		12.94	13.31
	AVG.	13.12	13.48
	Lot# 2 AVERAGE		13.30
13. Chang's Index, ml. CTM-5B		23.6	23.8
	Lot# 2 AVERAGE		23.7

14. RDS, Minimum Viscosity, cps. CTM-57A

	Min. Visc.	°C
#2-1	172	114
#2-2	124	114
AVG.	148	114

See Charts 14A-14B

15. NMR Vendor procedure

See Charts 15A-15B

U. S. Polymeric

Hamid M. Quraishi

Hamid M. Quraishi, Manager
Quality Assurance Department

ORIGINAL PAGE IS
OF POOR QUALITY

TYPICAL GAS CHROMATOGRAPH SET-UP

Operator	G.R.J.	Date	12/11/86
Column		Detector	FID
Length	6ft.	Voltage	
Dia.	1/4 in.	Sensit.	
Liquid Phase	AT-1000	Flow Rates, ml/min	
Wt. %	0.1	Hydrogen	60 Air 96
Support	GRAPHPAC	Scavenge	
Mesh	80/100	Split	
Carrier Gas	He	Temperature, °C	
Rotameter		Det.	220 Inj. 200
Inlet Press	60 psig	Column Initial	60
Rate	30 ml/min	Final	210
CHART SPEED		Rate	5°C/MIN.
SAMPLE	USP 349, 2-I	Solvent	THF
Size	0.1 µl	Concn.	0.1 1/40 g/ml

GAS CHROMATOGRAPHY STANDARD SOLVENT

TEST METHOD CTM-55

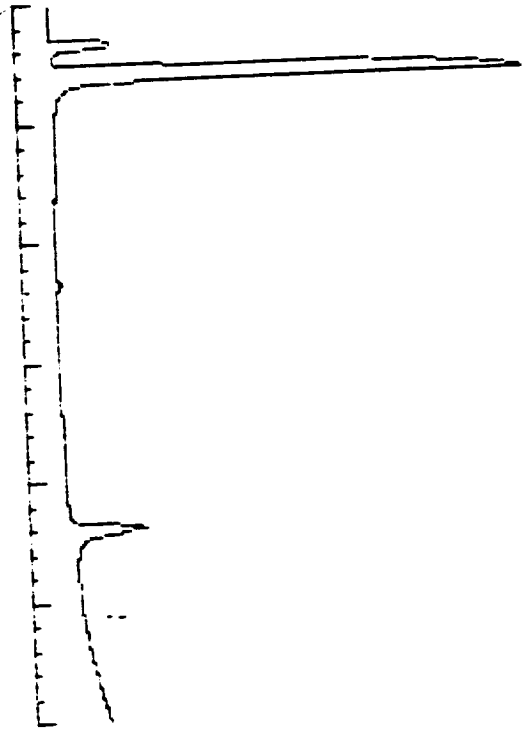
STANDARD SOLVENT/MONOMER	RETENTION TIME (MINS.)
MEOH	.6
ETHANOL	1.18
MECL2	1.28
ACETONE	1.45
IPA	1.83
THF	3.08
ACETONITRILE	3.2
CRESOL	4.03
MEK	4.08
FURFURAL	15.03
TOLUENE	17.98
CHLOROBENZENE	19.6
PHENOL	22.08

NOTE: THF WAS USED TO DILUTE THE RESIN SAMPLES.

ORIGINAL PAGE IS
OF POOR QUALITY

CHART 6A

REAL TIME CHROMATOGRAM ***



FINAL FULL SCALE MV.=1000 00

AMPLE: USP39A 2-1
MISC C=0.11190 GMS/ML

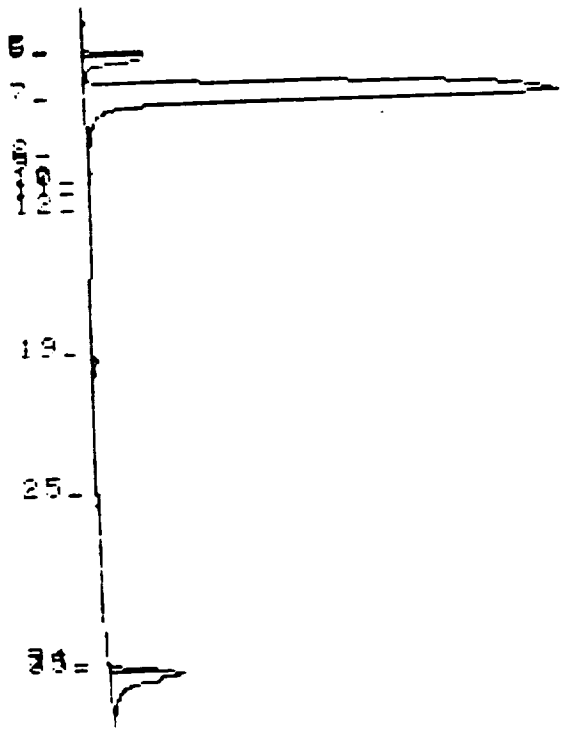
IME: 12:59
JATE: 12/11/86
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES
DELAY TIME: 0.00
CHAN: 0

PK NO	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
2	.63	7064	.075	3	358
5	1.65	79730	1.953	2	11467
6	1.78	201690	4.940	2	11452
7	3.30	3335700	81.708	3	90562
8	5.00	6073	.149	4	251
9	5.55	5751	.141	4	417
10	6.03	4291	.105	4	182
11	6.38	4282	.105	4	172
12	6.95	1101	.027	4	80
19	11.70	13778	.337	3	767
25	16.27	1075	.026	2	61
34	21.85	68060	1.667	2	10096
35	22.00	357860	8.766	2	14615

TOTAL AREA= 4082456
THRESHOLD= 1
MIN PI WIDTH= 15
AREA REJECT= 1000

VERTICAL SCALE FACTOR 1X



SAMPLE USP39A 2-1
MISC C=0.11190 GMS/ML

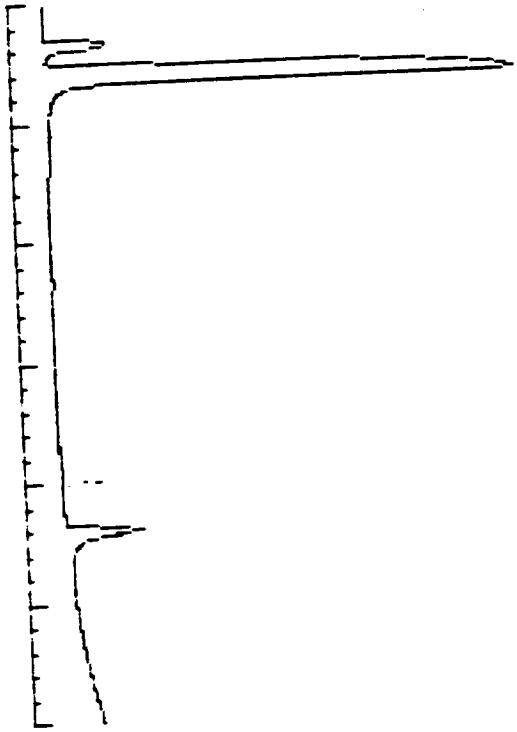
TIME 12:59
DATE: 12/11/86
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES
DELAY TIME: 0.00
CHAN: 0

PK NO.	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
5	1.65	79730	1.965	2	11467
6	1.78	201690	4.972	2	11452
7	3.30	3335700	82.225	3	90562
19	11.70	13778	.340	3	767
34	21.85	68060	1.678	2	10096
35	22.00	357860	8.821	2	14615

TOTAL AREA= 4056818
THRESHOLD= 1
MIN PI WIDTH= 15
AREA REJECT= 10000

*** REAL TIME CHROMATOGRAM ***



FINAL FULL SCALE MV.=1000.00

SAMPLE: USP39A 2-2
MISC.: C=0.10080 GMS/ML

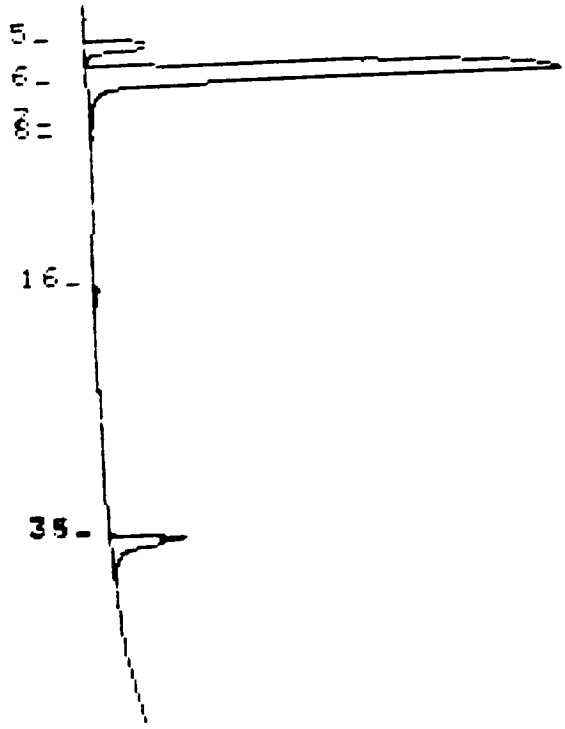
TIME: 14:47
DATE: 12/11/86
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES
DELAY TIME: 0.00
CHAN: 0

PK NO	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
2	.63	2693	.061	3	360
5	1.68	298230	6.703	2	11370
6	3.39	3695300	83.049	3	89961
7	5.08	4838	.109	4	199
8	5.58	4532	.102	2	478
16	11.70	14184	.319	3	714
34	21.88	53228	1.196	2	10083
35	22.03	376520	8.462	3	14774

TOTAL AREA= 4449524
THRESHOLD= 1
MIN PI WIDTH= 15
AREA REJECT= 1000

VERTICAL SCALE FACTOR 1X



SAMPLE: USP39A 2-2
MISC.: C=0.10080 GMS/ML

TIME: 14:47
DATE: 12/11/86
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES
DELAY TIME: 0.00
CHAN: 0

PK NO	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
5	1.68	298230	6.742	2	11370
6	3.38	3695300	83.543	3	89961
34	21.88	53228	1.203	2	10083
35	22.03	376520	8.512	3	14774

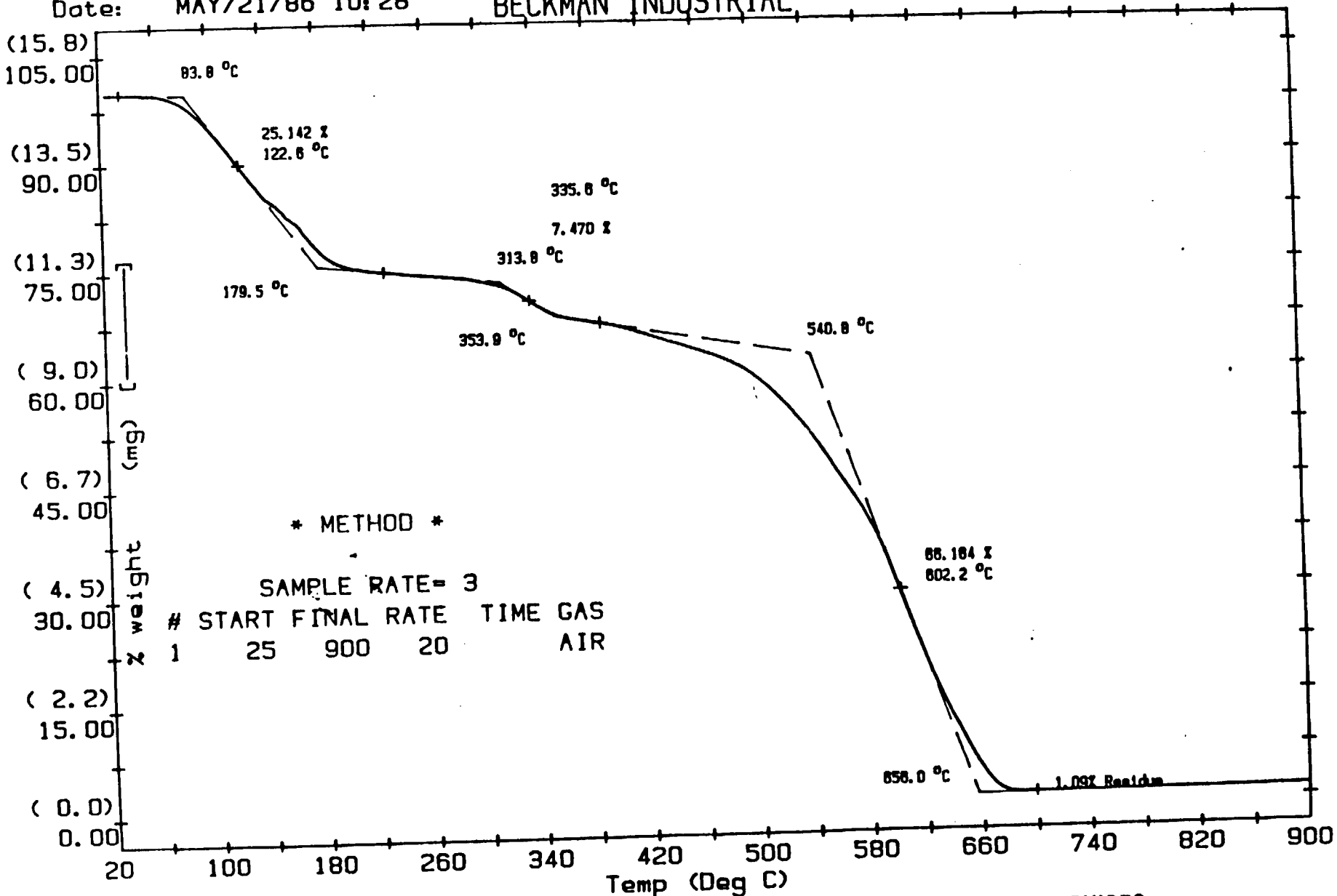
TOTAL AREA= 4423278
THRESHOLD= 1
MIN PI WIDTH= 15
AREA REJECT= 15000

Sample: USP39A71108 2-1
Size: 15.101 mg
Run No: MIR #13079 (I2)
Date: MAY/21/86 10:28

TGA

OMNITHERM DATA SYSTEM
BECKMAN INDUSTRIAL

Operator: M. WEGENER
Disk ID: DATA DISK #107
File No: D 34.DAT V2.1
Plotted: MAY/22/86 07:50



* METHOD *

SAMPLE RATE= 3

#	START	FINAL	RATE	TIME	GAS
1	25	900	20		AIR

Beckman Industrial™ ANALYTICAL LABORATORY SERVICES

ORIGINAL PAGE IS
OF POOR QUALITY

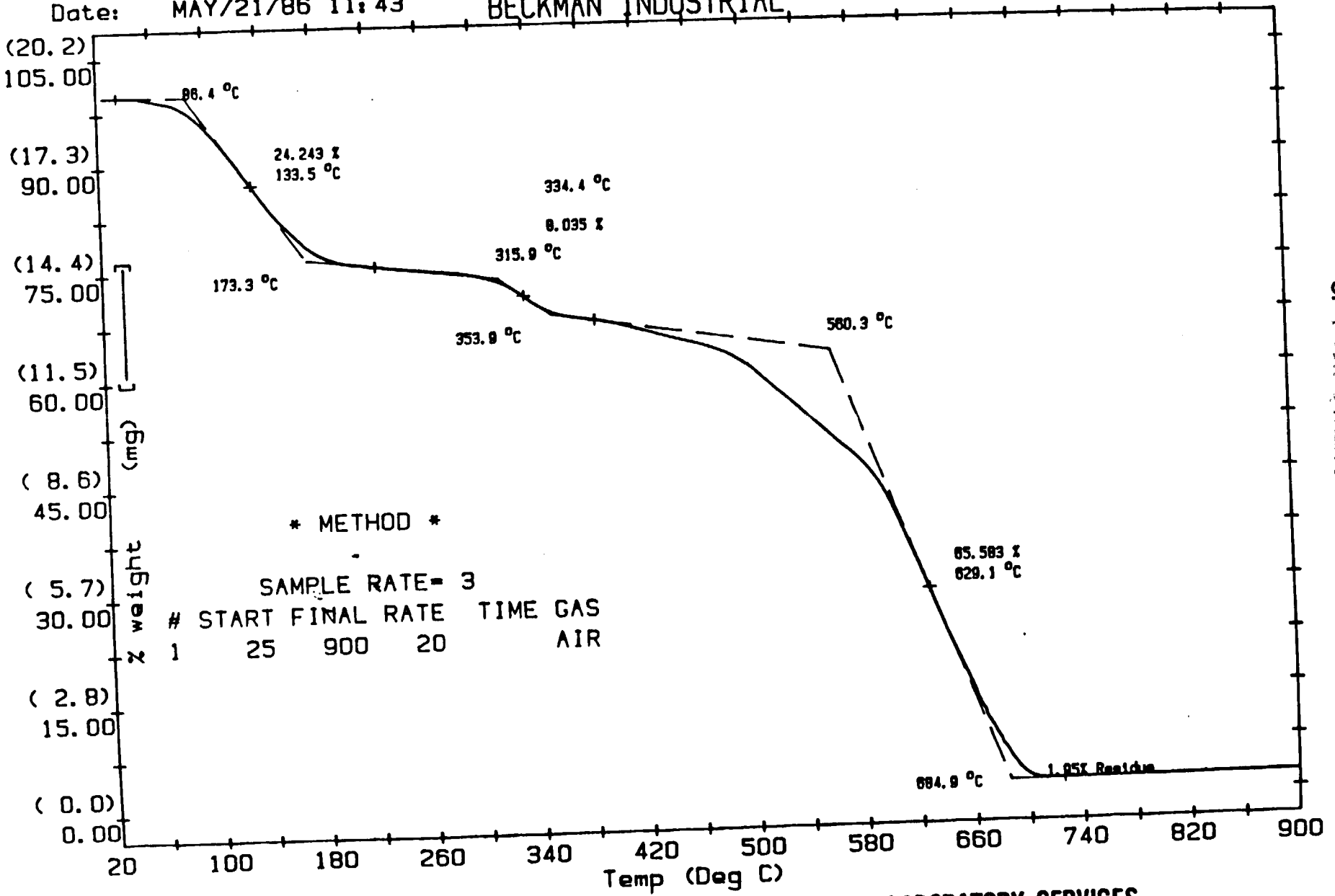
CHART 7A

Sample: USP39A71108 2-2
Size: 19.294 mg
Run No: MIR #13079 (I2)
Date: MAY/21/86 11:43

TGA

OMNITHERM DATA SYSTEM
BECKMAN INDUSTRIAL

Operator: M. WEGENER
Disk ID: DATA DISK #107
File No: D 35.DAT V2.1
Plotted: MAY/22/86 07:58



* METHOD *

SAMPLE RATE= 3

#	START	FINAL	RATE	TIME	GAS
1	25	900	20		AIR

Beckman Industrial™ ANALYTICAL LABORATORY SERVICES

CHART 7B

ORIGINAL PAGE IS
OF POOR QUALITY

PART NO. 990088

CHART 8A

RUN NO ___ DATE 4/3/86
OPERATOR ___
SAMPLE: 2 ℓ

ATM He @ 1 atm.
FLOW RATE 40 ml/min

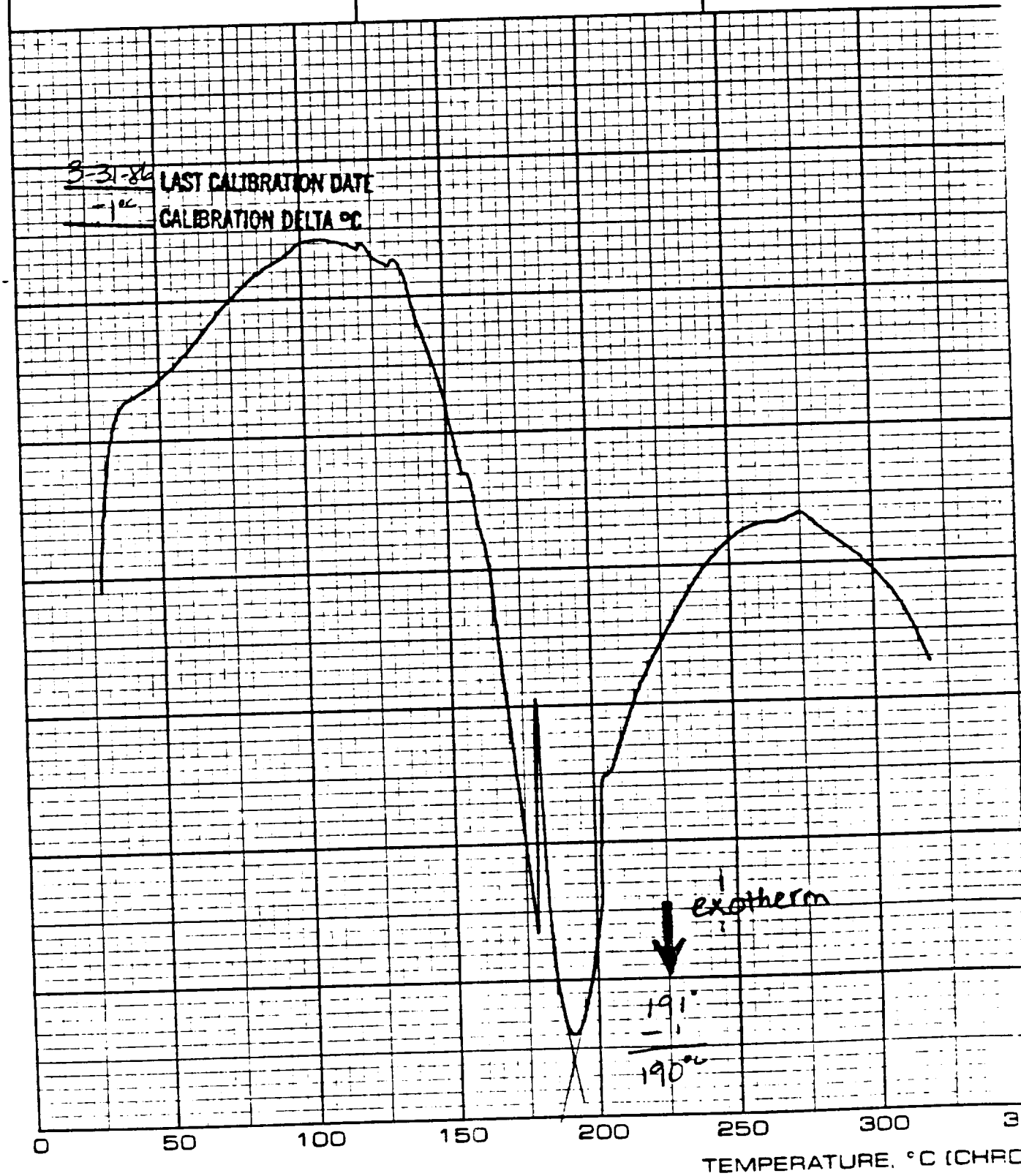
T-AXIS
SCALE, °C/in 50
PROG. RATE, °C/min 20
HEAT / COOL ___ ISO ___
SHIFT, in 0
− 1 °C

DTA-DSC
SCALE, °C/in 1.0/5
(mcal/sec)/in ___
WEIGHT, mg 4.5
REFERENCE ___
1 Al cup plus sa.

DUPONT Instruments

MEASURED VARIABLE ___

3-31-86 LAST CALIBRATION DATE
−1°C CALIBRATION DELTA °C



PART NO. 990088

CHART 8B

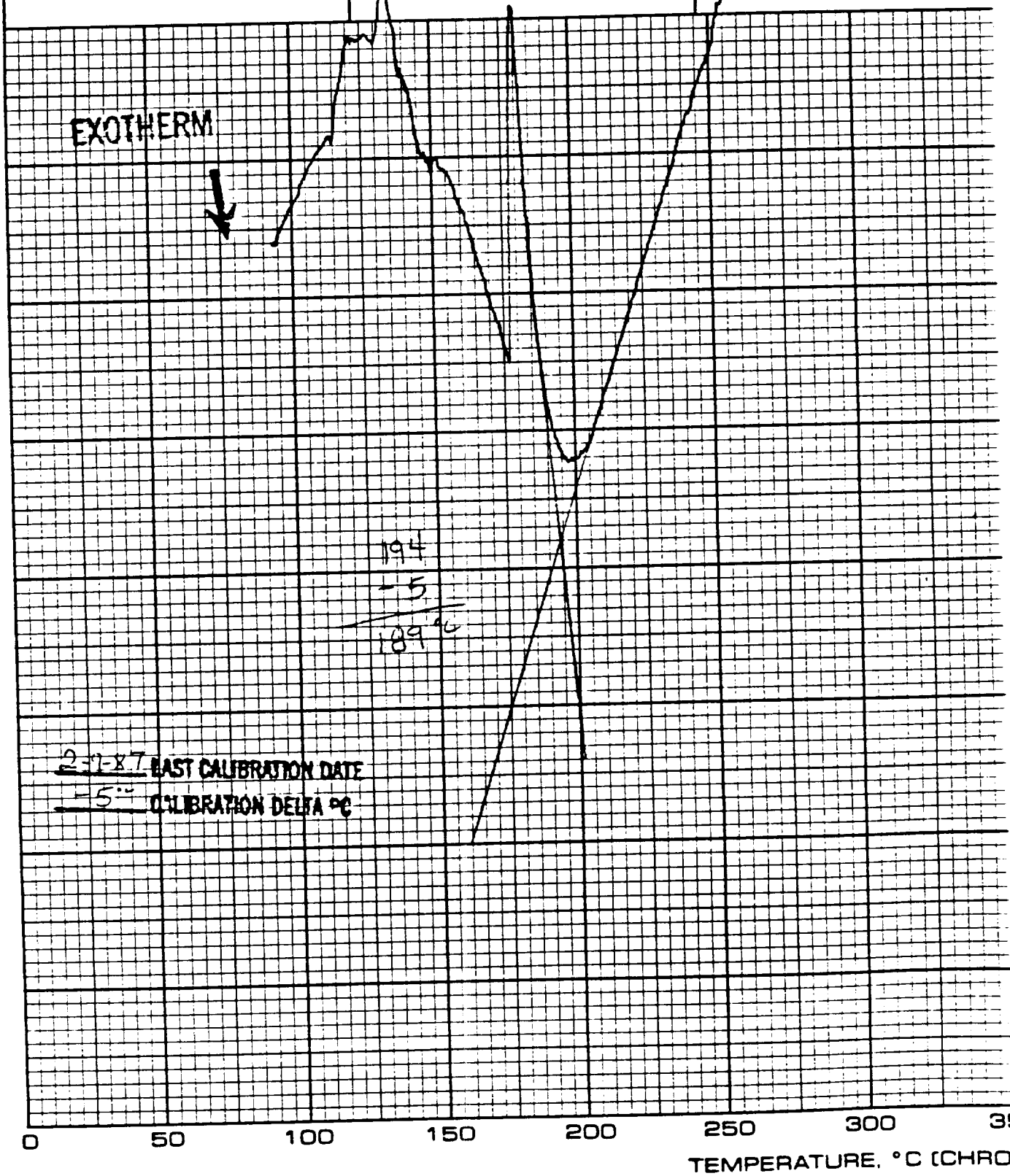
RUN NO ___ DATE 2-23-87
OPERATOR DLK
SAMPLE: 2-2
USP 39A
ATM N2 @ 1atm
FLOW RATE 40ml/min

T-AXIS
SCALE, °C/in 50
PROG. RATE, °C/min 20°
HEAT ✓ COOL ___ ISO ___
SHIFT, in 0

DTA-DSC
SCALE, °C/in 1.0/5x
[mcal/sec]/in ___
WEIGHT, mg 3.1
REFERENCE 1 alum seal

DUPONT Instruments

MEASURED VARIABLE ___



DATA FILE A:PHEN020.HDR TAKEN 09-01-1986 15:13:56

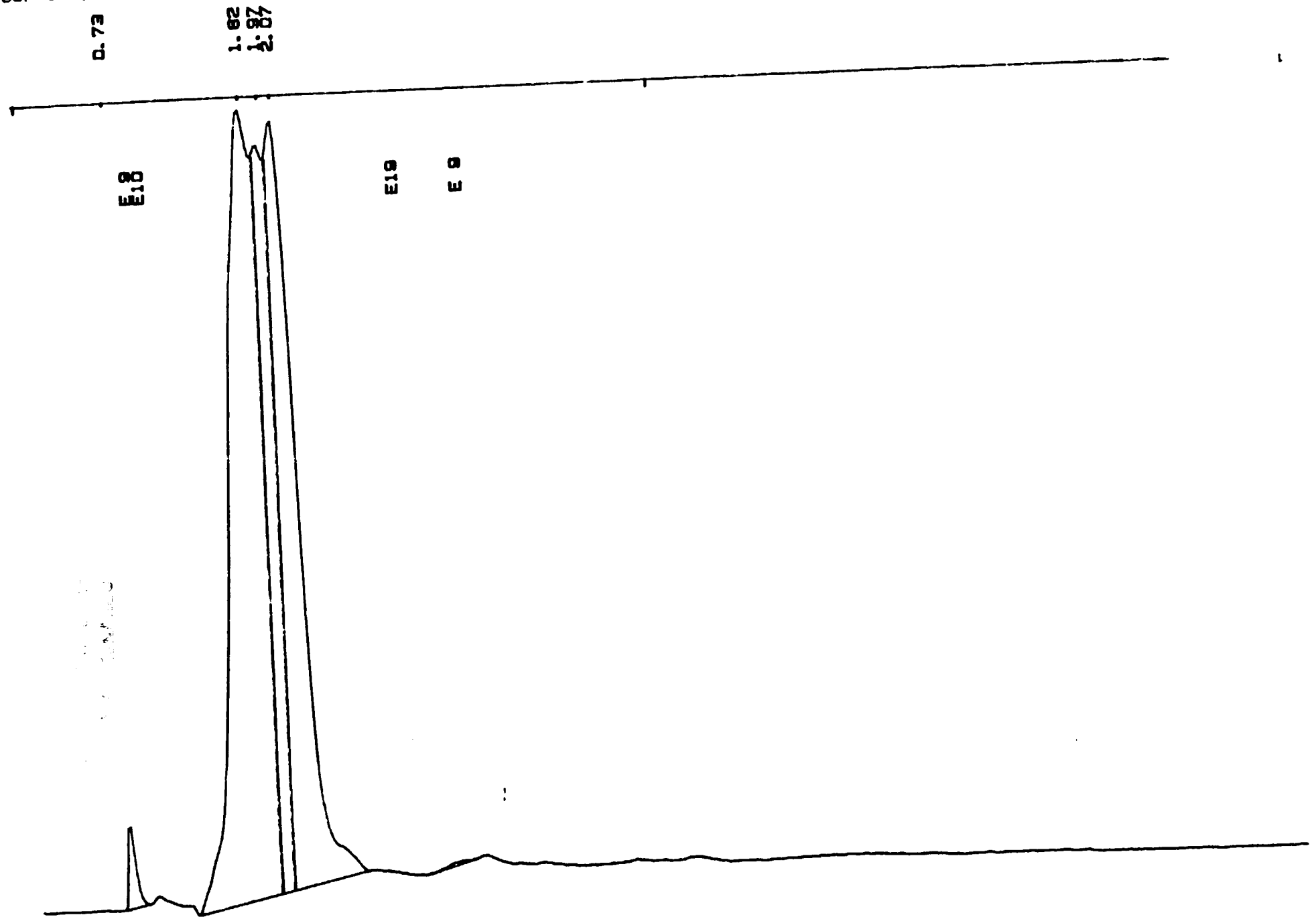
********* AREA PERCENT REPORT *********

```
**********************************************************************
* Sample Name: USP39A,2-1,C=5.555          Operator Initials: JGZ
* Date:  09-01-1986 15:13:56 Method:PHENOLIC   DATA FILE: A:PHEN020.PTS
* Interface: 4               Cycle#:  20       Channel#: 0   Vial#: N.A.
* Starting Peak Width:  10   Threshold:  .01
**********************************************************************
*  Instrument Type: BECKMAN HPLC          Column Type: MICROBONDAPAK C-18
*            Solvent Description: THF/WATER, 2:1 BY WEIGHT
*   Operating Conditions: R.T., FLOWRATE=1.5 ML/MIN
*           Detector 0: 220NM/.5AU          Detector 1:
*     Misc. Information:  LENGTH=25
**********************************************************************
Starting Delay:   0.00                    Ending Retention Time:   10.00
```

Pk No.	Ret Time	Peak Area	Area %	B L	Peak Ht.	Normalized %	Area/ Height
1	0.73	2256	1.2208	1	562	2.392	4.0
2	1.82	94314	51.0355	2	5417	100.000	17.4
3	1.97	29598	16.0160	2	5094	31.382	5.8
4	2.07	58633	31.7278	2	5278	62.168	11.1

Total Area: 184801 Area Reject: 1000 One sample per 1.000 sec.

DATA FILE=PHEN020 FROM 0.00 MIN. TO 10.00 MIN. LOW SCALE= 5.[illegible] MV. HIGH SCALE 10. MV
USP-39A, 2-1, C=5.555 MG/ML, 8/2/86, JGZ



DATA FILE A:PHEN027.HDR TAKEN 09-05-1986 11:31:38

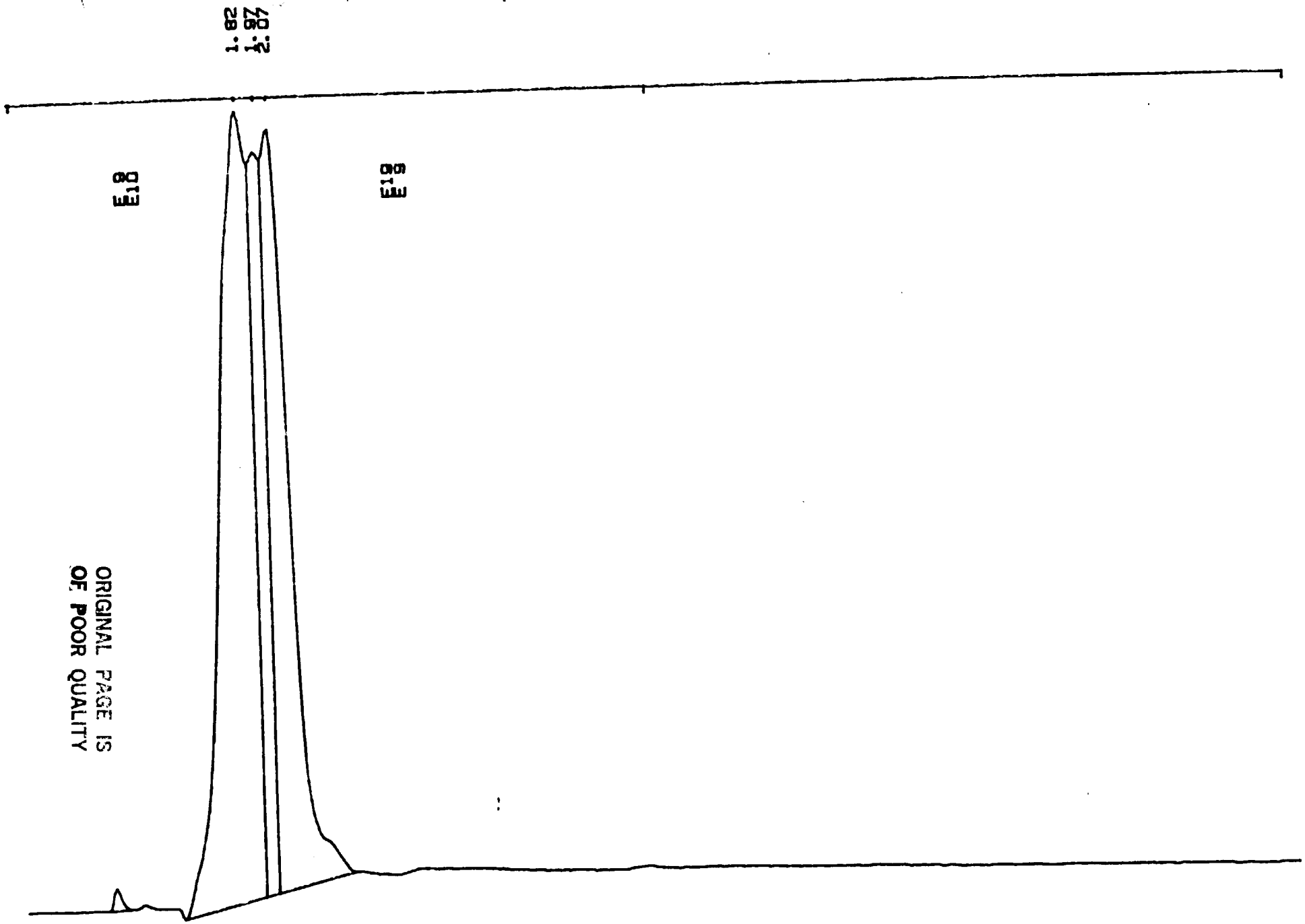
********* AREA PERCENT REPORT *********

```
**********                                                    Operator Initials: JGZ
* Sample Name: USP39A,2-2,C=6.99                             DATA FILE: A:PHEN027.PTS
* Date:  09-05-1986 11:31:38 Method:PHENOLIC                 Channel#: 0    Vial#: N.A.
* Interface: 4               Cycle#:  27
* Starting Peak Width:  10   Threshold:  .01
**********************************************************************
*  Instrument Type: BECKMAN HPLC          Column Type: MICROBONDAPAK C-18
*              Solvent Description: THF/WATER, 2:1 BY WEIGHT
*   Operating Conditions: R.T., FLOWRATE=1.5 ML/MIN
*              Detector 0: 220NM/.5AU          Detector 1:
*     Misc. Information:  LENGTH=25
**********************************************************************
                                                Ending Retention Time:   10.00
Starting Delay:   0.00
```

Pk No.	Ret Time	Peak Area	Area %	B L	Peak Ht.	Normalized %	Area/ Height
2	1.82	96860	53.0012	2	5305	100.000	18.3
3	1.97	28712	15.7109	2	4980	29.643	5.8
4	2.07	57179	31.2879	2	5119	59.032	11.2

Total Area: 182750 Area Reject: 1000 One sample per 1.000 sec.

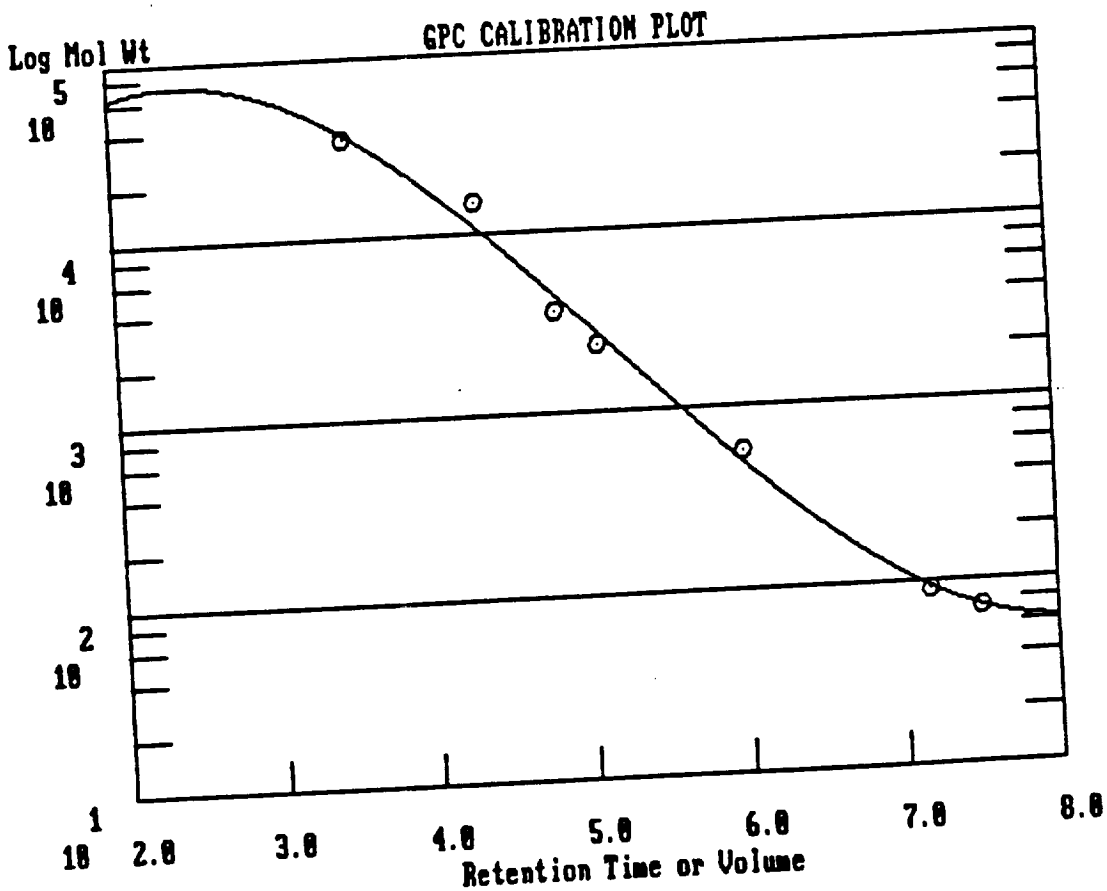
USP-39A(-2. C=6.89 MG/ML, 9/5/86, JGZ



*** Calibration Data ***
Calibration Name:
Misc Information:

Fit Type: 3
Log Mol Wt = A + Bx + Cx^2 + Dx^3
A= 2.538977 B= 2.115815 C= -.5646824 D= 3.606432E-02
Coefficient of Determination: 0.9902

Ret Time	Molecular Weight	Log Mol Wt
3.50	35000	4.544
4.33	15000	4.176
4.83	3600	3.556
5.09	2350	3.371
6.00	570	2.756
7.17	92	1.964
7.50	72	1.857



TA FILE A:GPC33.HDR TAKEN 08-05-1986 17:47:28

********* GPC REPORT *********

```
**********************************************************************
* Sample Name: USP39A 2-1=2.68                Operator Initials: GBF *
* Date:  08-05-1986 15:48:25 Method:          DATA FILE: A:GPC33.PTS *
  Interface: 5                 Cycle#:  33    Channel#: 0   Vial#: N.A. *
  Starting Peak Width:  60   Threshold:  0                           *
**********************************************************************
   Instrument Type: HPLC/BECKMAN          Column Type: ULTRASTYRAGEL 500A *
              Solvent Description: THF                                  *
*   Operating Conditions: T=35C FLOWRATE=2.0ML/MIN                      *
*            Detector 0: 254NM/.1AU          Detector 1:               *
      Misc. Information: CALIBRATION/GPC                                *
**********************************************************************
Starting Delay:    0.00                  Ending Retention Time:    10.00
 alibration file: GPCPHEN
 olecular Weight Distribution Averages
Baseline TIMES:    3.85 to   10.00   MW:      22295 to          2
rocess  TIMES:     3.85 to   10.00   MW:      22295 to          2
 otal Area:       243177
Mw=                 1800
Mn=                  334
 lw/Mn=           5.3756
 Iz=                 4852
 Iv=                 1551
```

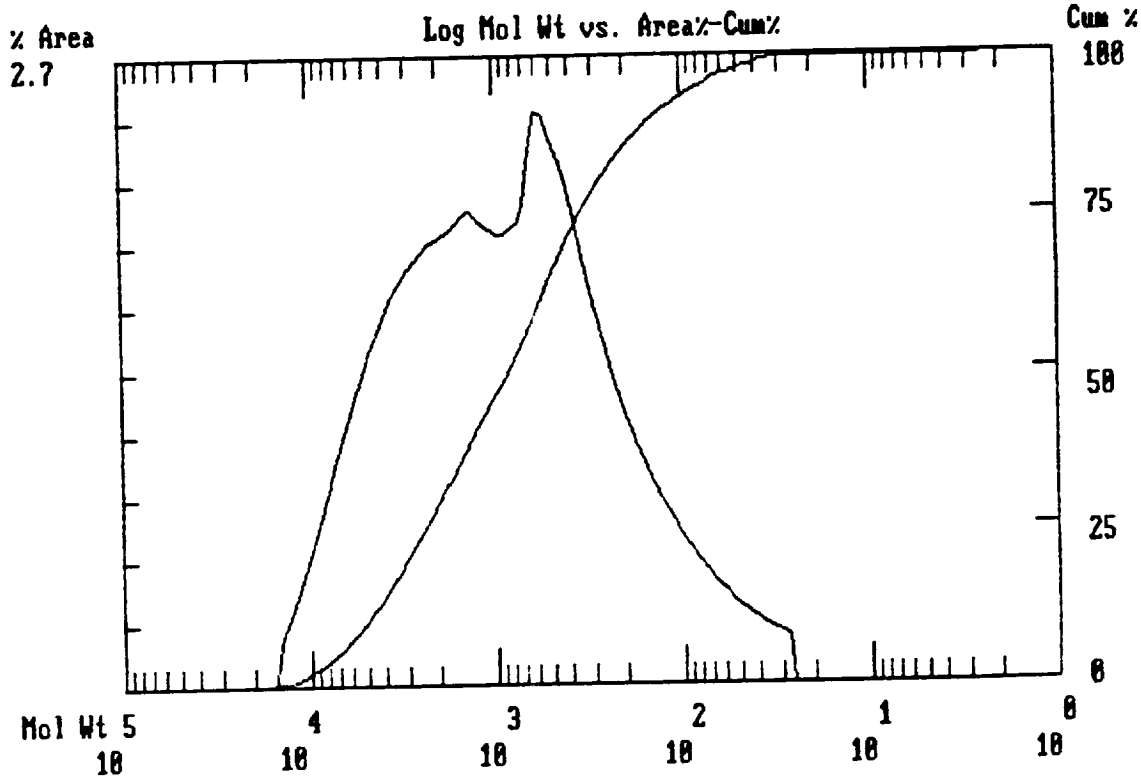


CHART 10B

FILE A:GPC34.HDR TAKEN 08-05-1986 17:50:20

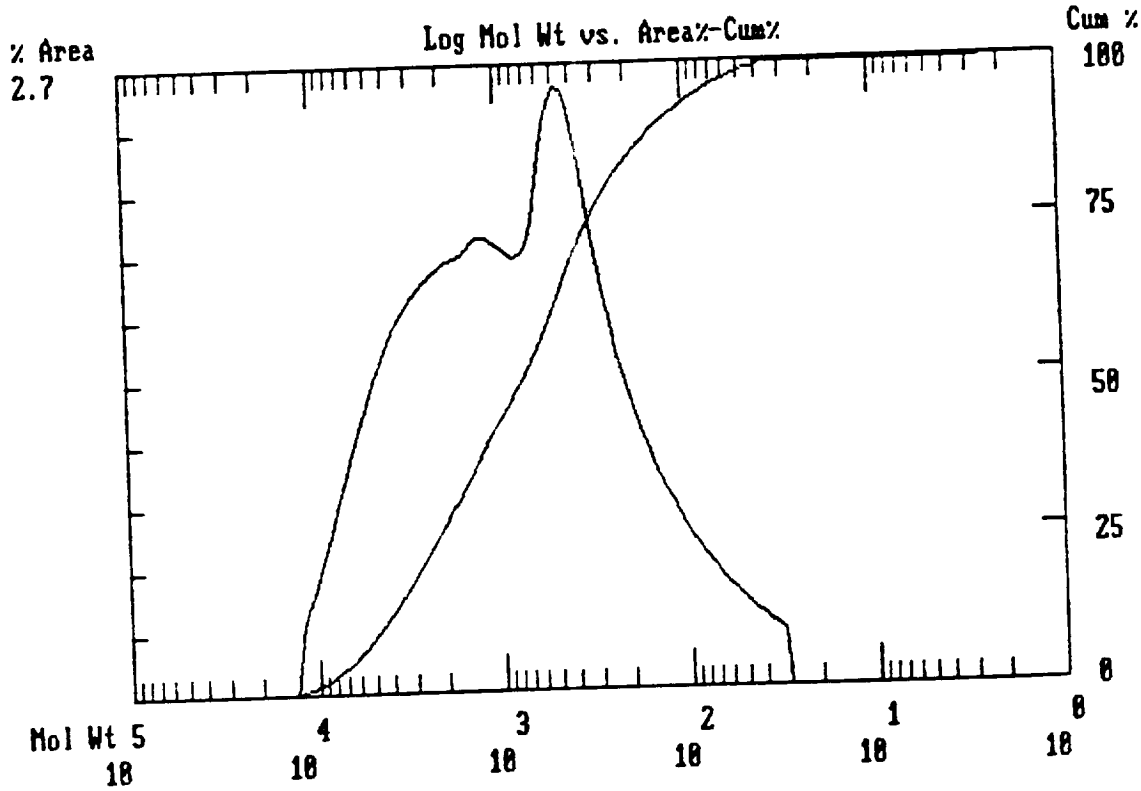
******** GPC REPORT ********

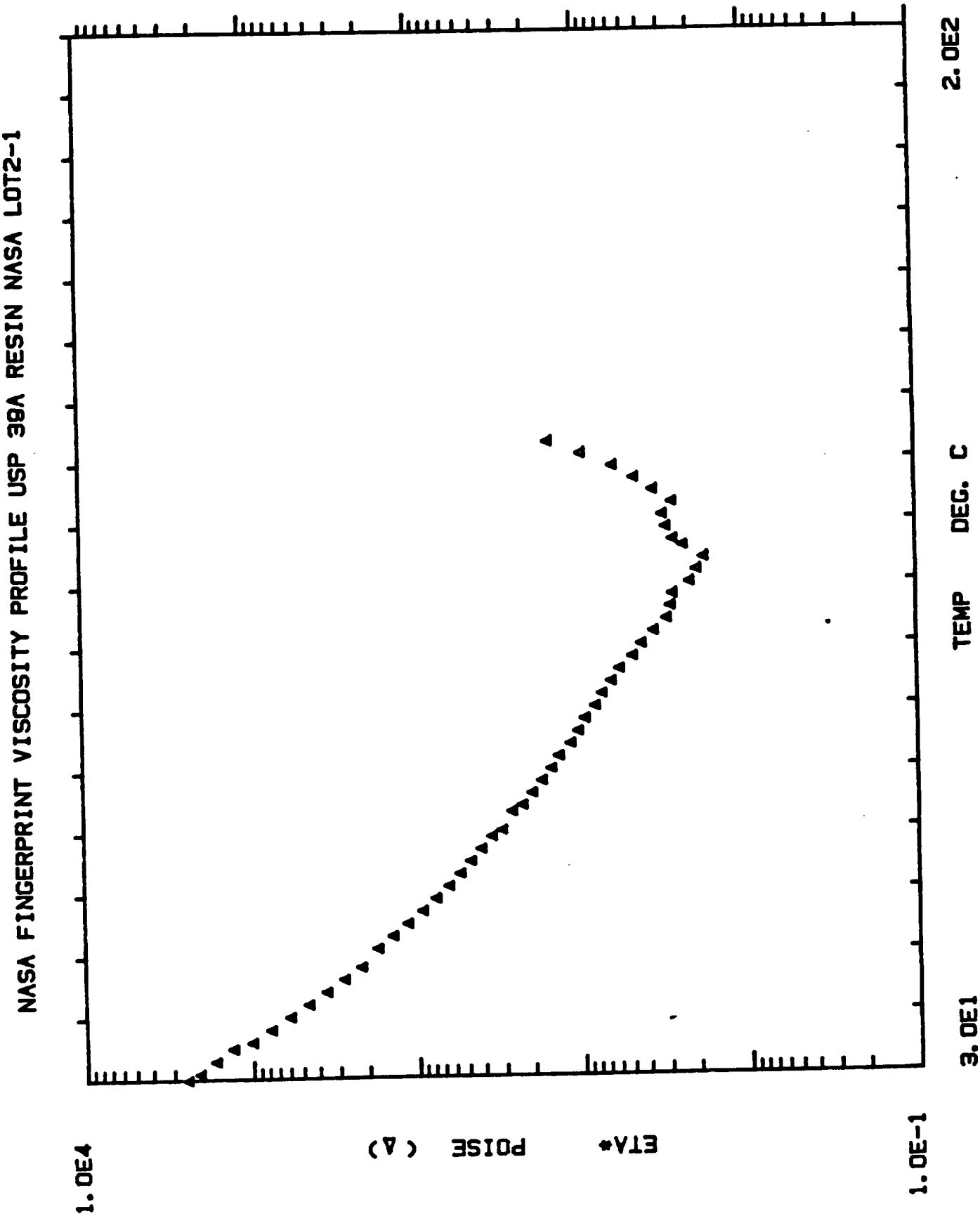
Sample Name: USP39A 2-2=2.68
Operator Initials: GBF
Date: 08-05-1986 16:04:45 Method:
DATA FILE: A:GPC34.FTS
Interface: 5 Cycle#: 34
Channel#: 0 Vial#: N.A.
Starting Peak Width: 60 Threshold: 0

Instrument Type: HPLC/BECKMAN
Column Type: ULTRASTYRAGEL 500A
Solvent Description: THF
Operating Conditions: T=35C FLOWRATE=2.0ML/MIN
Detector 0: 254NM/.1AU
Detector 1:
Misc. Information: CALIBRATION/GPC

Starting Delay: 0.00
Ending Retention Time: 10.00
Calibration file: GPCPHEN

Molecular Weight Distribution Averages					
Baseline TIMES:	3.85 to	10.00	MW:	22295 to	2
Process TIMES:	3.85 to	10.00	MW:	22295 to	2
Total Area:	198243				
Mw=	1631				
Mn	328				
Mw/Mn=	4.9600				
	4349				
	1407				




NASA FINGERPRINT VISCOSITY PROFILE USP 38A RESIN NASA LOT2-1
ETA* POISE (A)
1.0E4
1.0E-1
TEMP DEG. C
2.0E2
3.0E1

Rheometrics RDAP II

Experiment No. : 2 Sample No. : 1

Title:
AS FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT2-1

Operator :CP

Start and Time : Friday, August 15, 1986 - 13:30:37

Operating Mode : DYNAMIC

Sweep Type : CURE

Geometry : DISK & PLATE
RADIUS : 25.00
GAP : 0.50

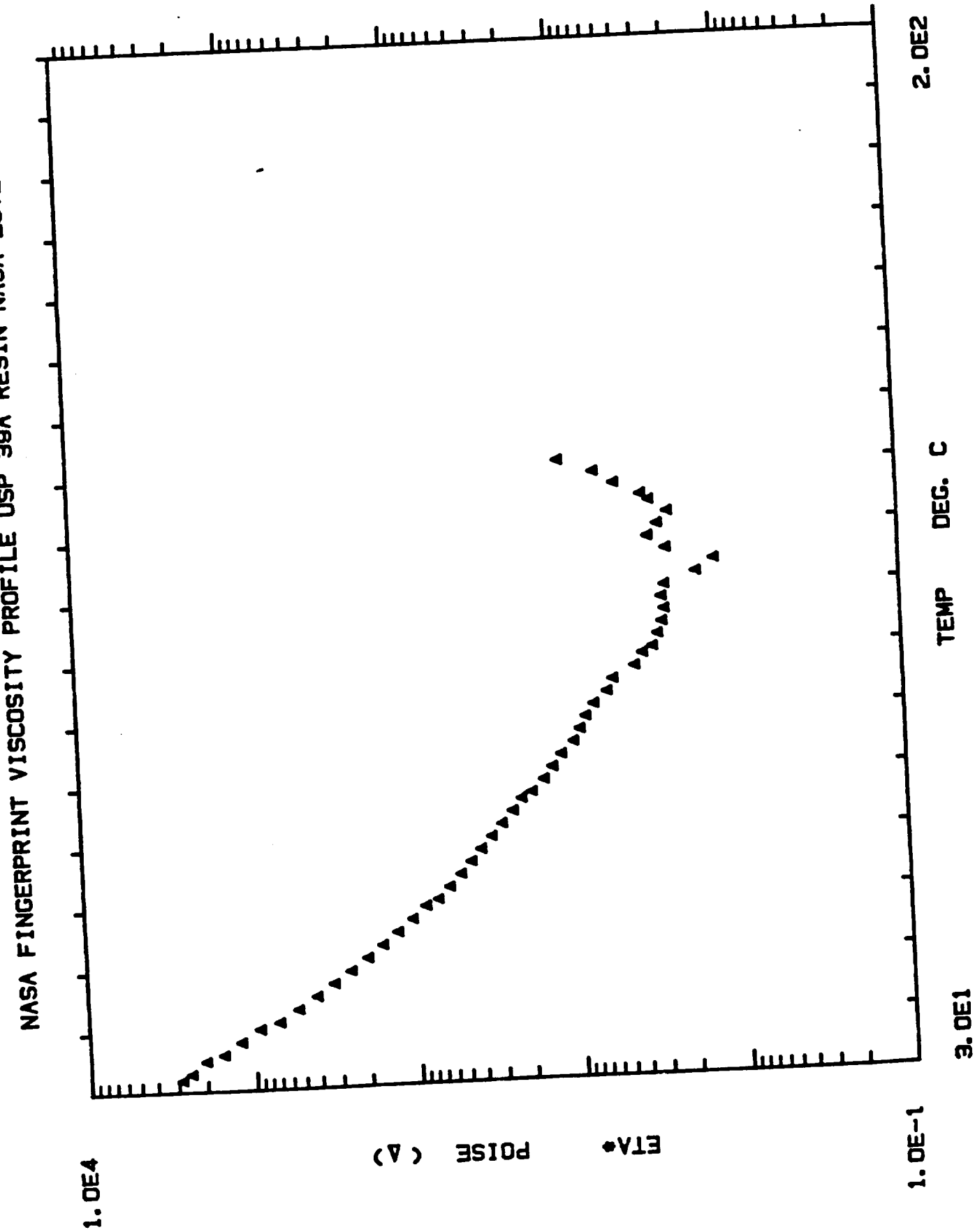
Notes :
STRAIN =50%
FREQUENCY =10 RAD/SEC

NO.	ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
1	2.489e+003	2.488e+003	4.844e+001	3.172e+002	2.000e-001	2.800e+001
2	2.642e+003	2.641e+003	4.082e+001	3.370e+002	1.000e+000	2.900e+001
3	2.428e+003	2.428e+003	3.159e+001	3.093e+002	2.000e+000	3.000e+001
4	2.051e+003	2.051e+003	3.626e+001	2.607e+002	3.000e+000	3.100e+001
5	1.636e+003	1.636e+003	3.612e+001	2.076e+002	4.000e+000	3.300e+001
6	1.283e+003	1.282e+003	3.520e+001	1.625e+002	5.000e+000	3.500e+001
7	9.857e+002	9.849e+002	3.027e+001	1.245e+002	6.000e+000	3.600e+001
8	7.555e+002	7.550e+002	2.754e+001	9.537e+001	7.000e+000	3.800e+001
9	5.786e+002	5.780e+002	2.598e+001	7.296e+001	8.000e+000	4.000e+001
10	4.479e+002	4.473e+002	2.357e+001	5.638e+001	9.000e+000	4.200e+001
11	3.477e+002	3.469e+002	2.768e+001	4.376e+001	1.000e+001	4.400e+001
12	2.715e+002	2.706e+002	2.171e+001	3.414e+001	1.100e+001	4.600e+001
13	2.136e+002	2.126e+002	2.044e+001	2.686e+001	1.200e+001	4.800e+001
14	1.693e+002	1.680e+002	2.056e+001	2.126e+001	1.300e+001	5.100e+001
15	1.371e+002	1.356e+002	2.031e+001	1.723e+001	1.400e+001	5.300e+001
16	1.110e+002	1.094e+002	1.889e+001	1.394e+001	1.500e+001	5.500e+001
17	9.041e+001	8.878e+001	1.708e+001	1.135e+001	1.600e+001	5.700e+001
18	7.490e+001	7.343e+001	1.476e+001	9.399e+000	1.700e+001	5.900e+001
19	6.248e+001	6.116e+001	1.280e+001	7.843e+000	1.800e+001	6.100e+001
20	5.336e+001	5.221e+001	1.105e+001	6.692e+000	1.900e+001	6.300e+001
21	4.604e+001	4.506e+001	9.437e+000	5.777e+000	2.000e+001	6.500e+001
22	3.975e+001	3.897e+001	7.829e+000	4.985e+000	2.100e+001	6.700e+001
23	3.415e+001	3.357e+001	6.480e+000	4.291e+000	2.200e+001	6.900e+001
24	2.971e+001	2.916e+001	5.717e+000	3.731e+000	2.300e+001	7.000e+001
25	2.574e+001	2.522e+001	5.128e+000	3.229e+000	2.400e+001	7.300e+001
26	2.230e+001	2.191e+001	4.110e+000	2.800e+000	2.500e+001	7.400e+001
27	1.940e+001	1.907e+001	3.540e+000	2.434e+000	2.600e+001	7.600e+001
28	1.690e+001	1.657e+001	3.296e+000	2.121e+000	2.700e+001	7.800e+001
29	1.480e+001	1.453e+001	2.816e+000	1.857e+000	2.800e+001	8.000e+001
30	1.328e+001	1.299e+001	2.741e+000	1.667e+000	2.900e+001	8.200e+001
31	1.128e+001	1.105e+001	2.093e+000	1.411e+000	3.000e+001	8.400e+001
32	1.007e+001	9.917e+000	1.751e+000	1.264e+000	3.100e+001	8.600e+001
33	9.165e+000	9.050e+000	1.573e+000	1.151e+000	3.200e+001	8.800e+001
34	7.912e+000	7.827e+000	1.152e+000	9.930e-001	3.300e+001	9.000e+001
35	7.192e+000	7.145e+000	8.195e-001	9.030e-001	3.400e+001	9.200e+001
36	6.315e+000	6.283e+000	6.316e-001	7.925e-001	3.500e+001	9.400e+001
37	5.609e+000	5.600e+000	3.291e-001	7.044e-001	3.600e+001	9.600e+001
38	4.670e+000	4.658e+000	3.331e-001	5.960e-001	3.700e+001	9.800e+001
39	4.120e+000	4.120e+000	0.000e+000	5.173e-001	3.800e+001	1.000e+002
40	3.470e+000	3.470e+000	4.507e-002	4.352e-001	3.900e+001	1.020e+002
41	2.889e+000	2.889e+000	0.000e+000	3.627e-001	4.000e+001	1.040e+002
42	2.743e+000	2.724e+000	3.150e-001	3.445e-001	4.100e+001	1.060e+002
43	2.657e+000	2.581e+000	6.310e-001	3.335e-001	4.200e+001	1.080e+002
44	2.102e+000	2.053e+000	4.494e-001	2.642e-001	4.300e+001	1.100e+002
45	1.906e+000	1.852e+000	4.519e-001	2.394e-001	4.400e+001	1.120e+002
46	1.720e+000	1.672e+000	4.071e-001	2.162e-001	4.500e+001	1.140e+002
47	2.296e+000	2.202e+000	6.523e-001	2.884e-001	4.600e+001	1.160e+002
48	2.627e+000	2.569e+000	5.507e-001	3.301e-001	4.700e+001	1.170e+002
49	2.883e+000	2.787e+000	7.547e-001	3.621e-001	4.800e+001	1.190e+002
50	3.024e+000	2.813e+000	1.135e+000	3.799e-001	4.900e+001	1.210e+002

FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT2-1

NO.	ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
[illegible]	2.642e+000	2.503e+000	8.451e-001	3.320e-001	5.000e+001	1.230e+002
52	3.438e+000	3.279e+000	1.035e+000	4.316e-001	5.100e+001	1.250e+002
[illegible]3	4.448e+000	4.263e+000	1.269e+000	5.583e-001	5.200e+001	1.270e+002
[illegible]4	5.984e+000	5.761e+000	1.618e+000	7.514e-001	5.300e+001	1.290e+002
55	9.317e+000	8.988e+000	2.454e+000	1.171e+000	5.400e+001	1.310e+002
56	1.470e+001	1.401e+001	4.424e+000	1.845e+000	5.500e+001	1.330e+002

CHART 14B


NASA FINGERPRINT VISCOSITY PROFILE USP 38A RESIN NASA LOT2-2
ETA* POISE (A)
TEMP DEG. C
1.0E4
1.0E-1
2.0E2
3.0E1

Rheometrics RECAP II

---

xperiment No. : 3 Sample No. : 1

:_e:
ASA FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT2-2

p: ator :CP

a'e and Time : Friday, August 15, 1986 - 13:50:53

perating Mode : DYNAMIC

w ep Type : CURE

eometry : DISK & PLATE
RADIUS : 25.00
GAP : 0.50

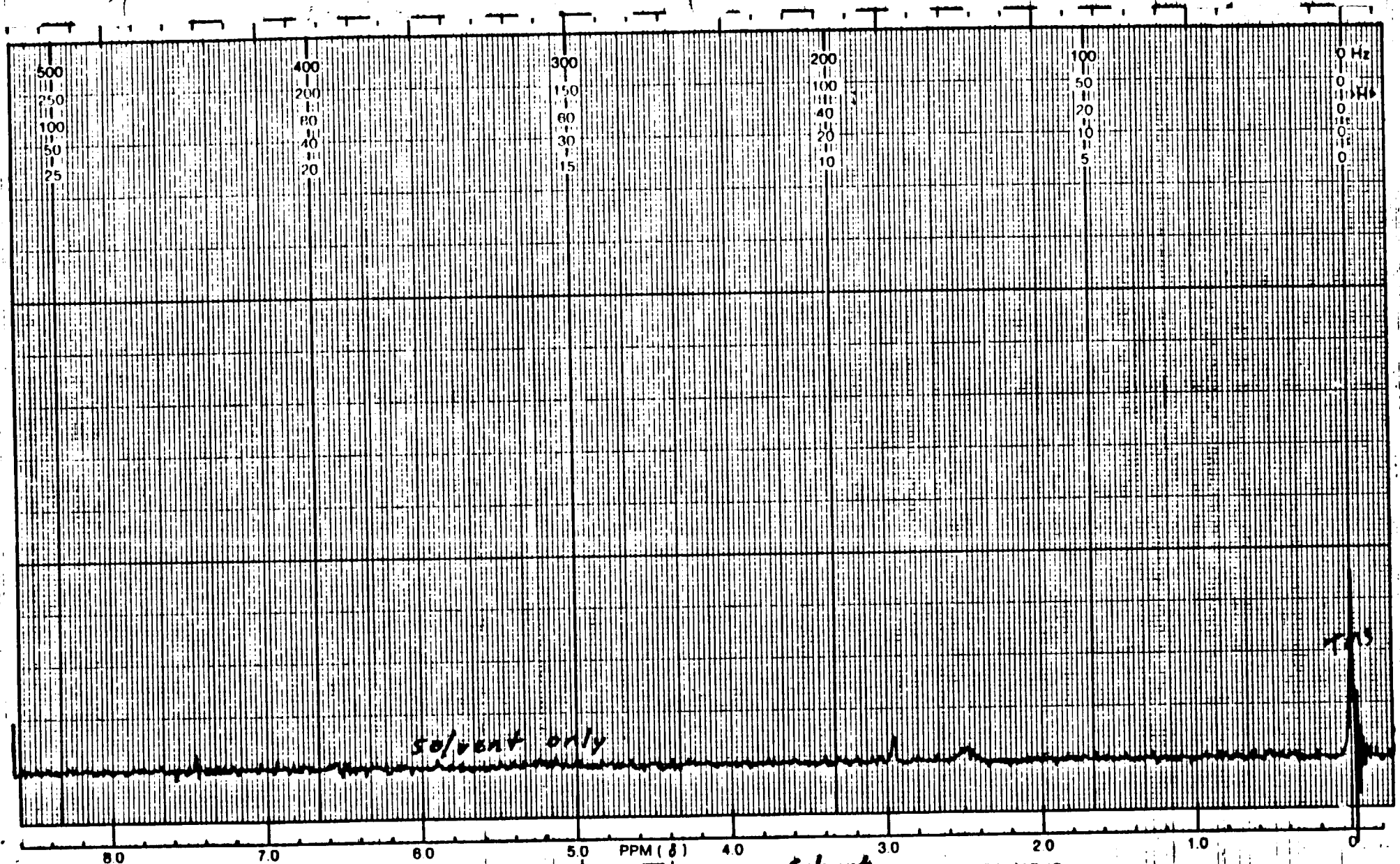
lo es :
T AIN =50%
REQUENCY =10 RAD/SEC

ASA FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT#2

N.	ETA+ POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
1	2.748e+003	2.747e+003	4.963e+001	3.500e+002	2.000e-001	3.200e+001
2	2.751e+003	2.750e+003	5.589e+001	3.503e+002	1.000e+000	3.200e+001
3	2.407e+003	2.407e+003	4.550e-001	3.062e+002	2.000e+000	3.300e+001
4	1.952e+003	1.952e+003	4.134e+001	2.476e+002	3.000e+000	3.500e+001
5	1.521e+003	1.520e+003	3.489e+001	1.925e+002	4.000e+000	3.600e+001
6	1.181e+003	1.180e+003	3.659e+001	1.493e+002	5.000e+000	3.800e+001
7	9.014e+002	9.010e+002	2.717e+001	1.137e+002	6.000e+000	4.000e+001
8	6.851e+002	6.845e+002	2.800e+001	8.640e+001	7.000e+000	4.100e+001
9	5.225e+002	5.219e+002	2.522e+001	6.579e+001	8.000e+000	4.300e+001
10	4.013e+002	4.007e+002	2.174e+001	5.052e+001	9.000e+000	4.500e+001
11	3.136e+002	3.129e+002	2.112e-001	3.947e+001	1.000e+001	4.700e+001
12	2.457e+002	2.449e+002	2.013e+001	3.090e+001	1.100e+001	4.900e+001
13	1.938e+002	1.928e+002	1.994e+001	2.436e+001	1.200e+001	5.100e+001
14	1.561e+002	1.549e+002	1.938e+001	1.961e+001	1.300e+001	5.300e+001
15	1.257e+002	1.244e+002	1.839e+001	1.580e+001	1.400e+001	5.500e+001
16	1.014e+002	1.003e+002	1.543e+001	1.273e+001	1.500e+001	5.700e+001
17	8.340e+001	8.234e+001	1.330e+001	1.047e+001	1.600e+001	5.900e+001
18	7.033e+001	6.940e+001	1.145e+001	8.840e+000	1.700e+001	6.000e+001
19	5.969e+001	5.884e+001	1.001e+001	7.496e+000	1.800e+001	6.200e+001
20	5.047e+001	4.972e+001	8.644e+000	6.340e+000	1.900e+001	6.400e+001
21	4.340e+001	4.276e+001	7.440e+000	5.447e+000	2.000e+001	6.600e+001
22	3.759e+001	3.701e+001	6.560e+000	4.720e+000	2.100e+001	6.800e+001
23	3.215e+001	3.168e+001	5.477e+000	4.034e+000	2.200e+001	7.000e+001
24	2.777e+001	2.736e+001	4.723e+000	3.486e+000	2.300e+001	7.200e+001
25	2.370e+001	2.333e+001	4.172e+000	2.977e+000	2.400e+001	7.400e+001
26	2.079e+001	2.049e+001	3.492e+000	2.609e+000	2.500e+001	7.600e+001
27	1.794e+001	1.770e+001	2.927e+000	2.253e+000	2.600e+001	7.700e+001
28	1.506e+001	1.483e+001	2.647e+000	1.890e+000	2.700e+001	7.900e+001
29	1.327e+001	1.309e+001	2.197e+000	1.666e+000	2.800e+001	8.100e+001
30	1.166e+001	1.154e+001	1.650e+000	1.463e+000	2.900e+001	8.300e+001
31	9.733e+000	9.579e+000	1.748e+000	1.222e+000	3.000e+001	8.500e+001
32	8.840e+000	8.742e+000	1.311e+000	1.110e+000	3.100e+001	8.700e+001
33	8.088e+000	7.995e+000	1.222e+000	1.015e+000	3.200e+001	8.900e+001
34	7.169e+000	7.105e+000	9.554e-001	9.000e-001	3.300e+001	9.100e+001
35	5.902e+000	5.868e+000	6.306e-001	7.406e-001	3.400e+001	9.300e+001
36	5.403e+000	5.353e+000	7.366e-001	6.783e-001	3.500e+001	9.500e+001
37	3.945e+000	3.945e+000	3.298e-002	4.951e-001	3.600e+001	9.700e+001
38	3.514e+000	3.503e+000	2.691e-001	4.410e-001	3.700e+001	9.900e+001
39	3.057e+000	3.055e+000	1.028e-001	3.835e-001	3.800e+001	1.000e+002
40	2.824e+000	2.824e+000	5.250e-002	3.546e-001	3.900e+001	1.020e+002
41	2.639e+000	2.638e+000	5.008e-002	3.310e-001	4.000e+001	1.040e+002
42	2.532e+000	2.532e+000	0.000e+000	3.180e-001	4.100e+001	1.060e+002
43	2.625e+000	2.619e+000	1.781e-001	3.298e-001	4.200e+001	1.080e+002
44	2.504e+000	2.427e+000	6.148e-001	3.143e-001	4.300e+001	1.100e+002
45	1.607e+000	1.519e+000	5.247e-001	2.019e-001	4.400e+001	1.120e+002
46	1.244e+000	1.234e+000	1.583e-001	1.560e-001	4.500e+001	1.140e+002
47	2.421e+000	2.362e+000	5.321e-001	3.040e-001	4.600e+001	1.160e+002
48	3.097e+000	2.937e+000	9.815e-001	3.888e-001	4.700e+001	1.180e+002
49	2.684e+000	2.593e+000	6.906e-001	3.370e-001	4.800e+001	1.200e+002
50	2.321e+000	2.208e+000	7.159e-001	2.914e-001	4.900e+001	1.220e+002

NASA FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT2-2

NO.	ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
1	2.992e+000	2.793e+000	1.074e+000	3.755e-001	5.000e+001	1.240e+002
52	3.334e+000	3.139e+000	1.123e+000	4.188e-001	5.100e+001	1.250e+002
53	4.823e+000	4.690e+000	1.125e+000	6.053e-001	5.200e+001	1.270e+002
54	6.376e+000	6.167e+000	1.617e+000	8.006e-001	5.300e+001	1.290e+002
55	1.043e+001	9.972e+000	3.074e+000	1.309e+000	5.400e+001	1.310e+002



SWEEP OFFSET (Hz): 0
SPECTRUM AMPLITUDE: 1.0
INTEGRAL AMPLITUDE: —
SPINNING RATE (RPS): 30

MANUAL
SWEEP TIME (SEC): 50 250 500 1000
SWEEP WIDTH (Hz): 75 50 100 250 500
FILTER: 1 2 3 4 5 6 7 8
RF POWER LEVEL: 0.30

AUTO ☐
(250)
(500)
(2)
(.05)

SAMPLE: Solvent
SOLVENT: Unisol-d + 0.62 TMS
DEC. LEVEL

REMARKS:

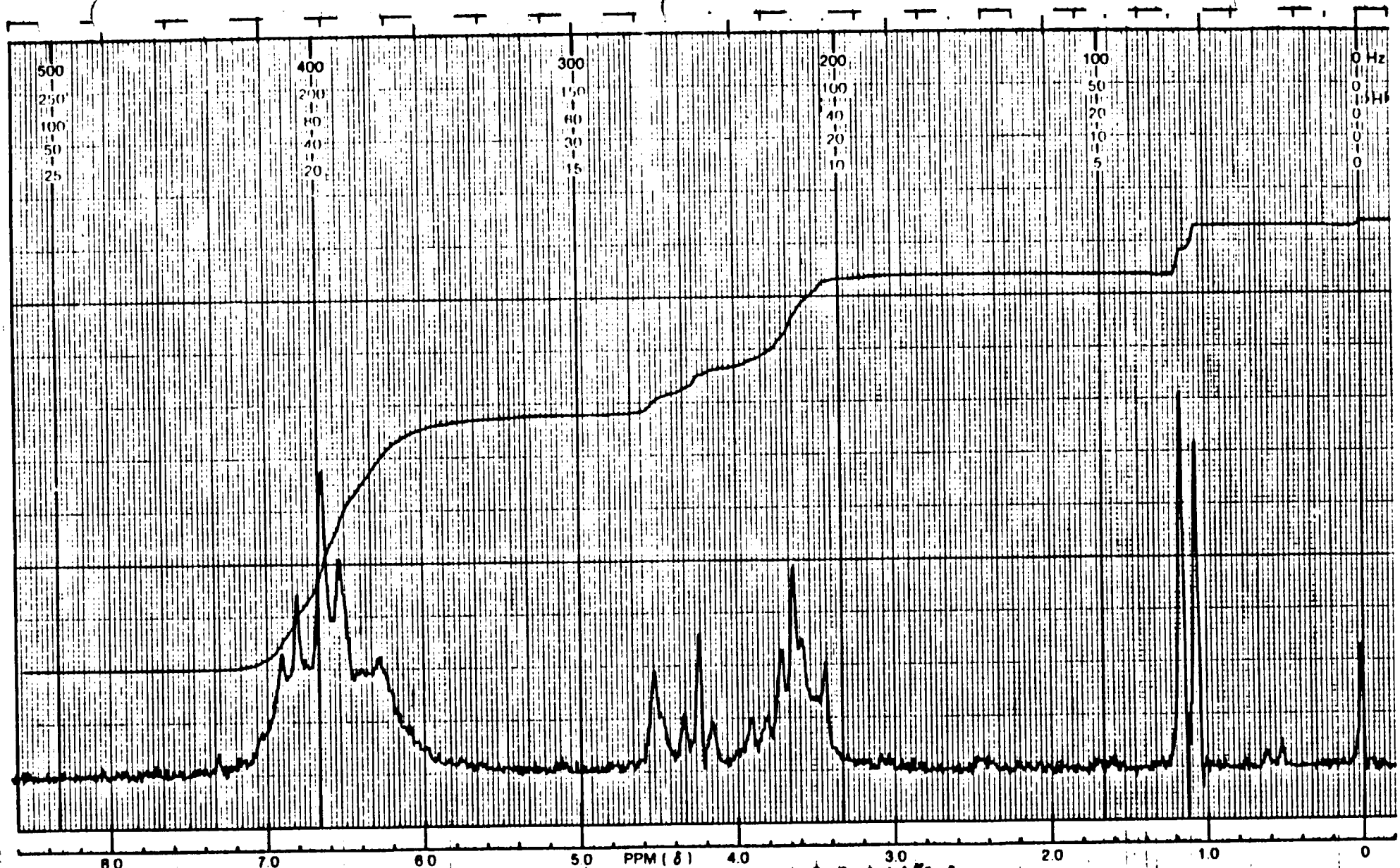
ORIGINAL PAGE IS OF POOR QUALITY

SOLVENT ONLY SCAN

NORELL, INC.
LANDISVILLE, N.J. 08326
Phone: (609) 697-0020

DATE: 3-21-86 OPERATOR DGW SPECTRUM NO. 1A of 7

solvent scan



SWEEP OFFSET (Hz): 0
SPECTRUM AMPLITUDE: 8.0
INTEGRAL AMPLITUDE: 5.0
SPINNING RATE (RPS): 30

MANUAL
SWEEP TIME (SEC): 50 250 500 1000
SWEEP WIDTH (Hz): 25 50 100 250 500
FILTER: 1 2 3 4 5 6 7 8
RF POWER LEVEL: 0.25

AUTO ☐
(250)
(500)
(2)
(.05)

SAMPLE: USP-39A Lot#2-1
SOLVENT: Unisol-d +0.5% TMS
DEC. LEVEL

REMARKS: 0.130 gm sample
0.888 gm solvent

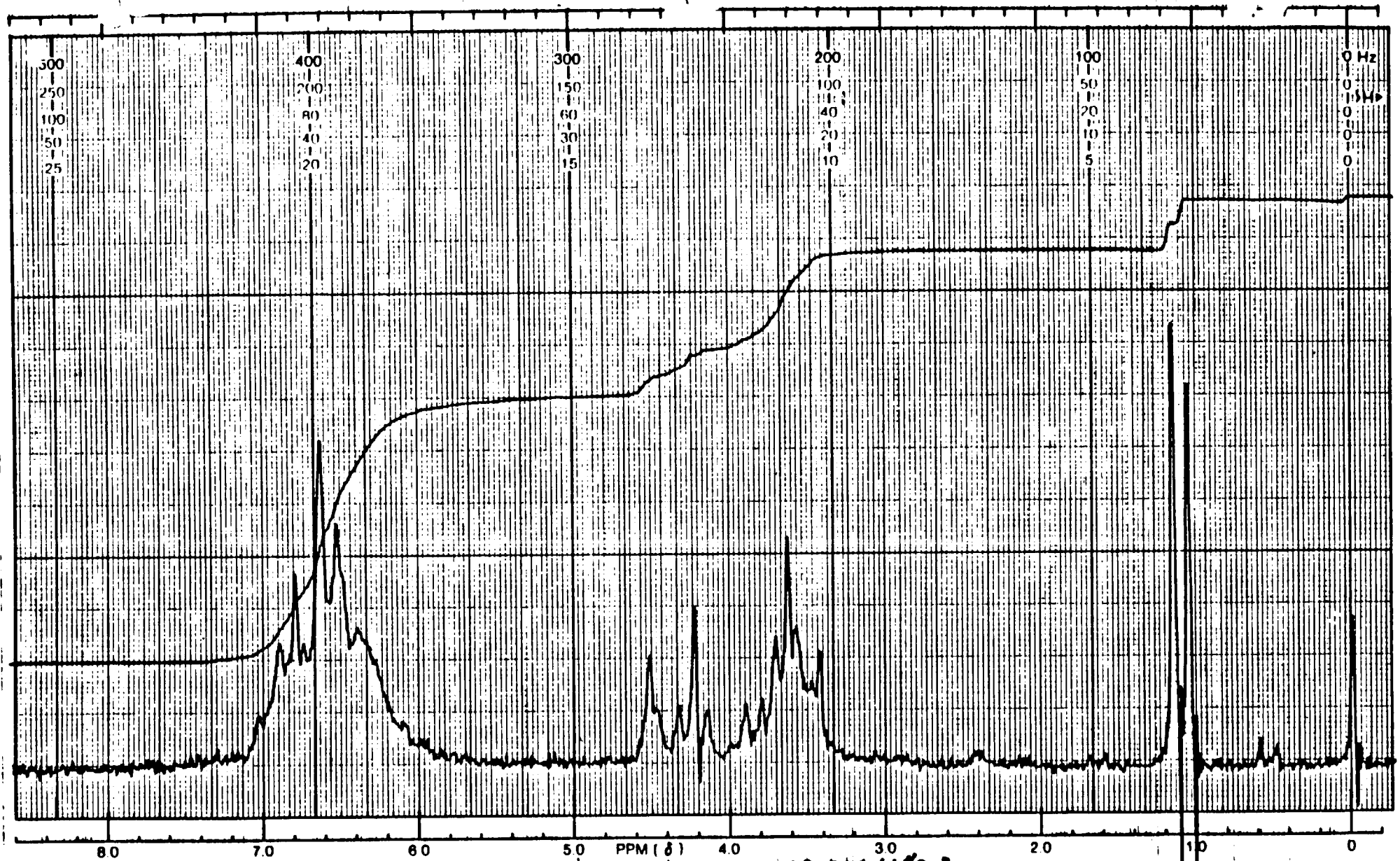
CHART 15A

NORELL, INC.
LANDISVILLE, N.J. 08326
T60 Phone: (609) 697-0020

DATE: 3-21-96

OPERATOR DGW

SPECTRUM NO. 3 of 7 USP-39A Lot#2-1



SWEEP OFFSET (Hz): 0
SPECTRUM AMPLITUDE: 1.0
INTEGRAL AMPLITUDE: 5.0
SPINNING RATE (RPS): 20

MANUAL
SWEEP TIME (SEC): 30 250 500 1000
SWEEP WIDTH (Hz): 25 50 100 250 500
FILTER: 1 2 3 4 5 6 7 8
RF POWER LEVEL: 0.25

AUTO ☐
(250)
(500)
(2)
(.05)

SAMPLE: USP-39M Lot#2-2
SOLVENT: Unisol-d+0.52TMS
DEC. LEVEL

REMARKS: 0.162 gm sample
1.072 gm solvent

CHART 15B

NORELL, INC.
LANDISVILLE, N.J. 08326
T60 Phone: (609) 697-0020

DATE: 3-21-86

OPERATOR DGW

SPECTRUM NO. 4 of 7 USP-39A
Lot# 2-2

TABLE OF CONTENTS

FABRIC TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

WCA Fabric for NASA Lot# 2 (KAISER)

CHARTS

U.S. Polymeric

FABRIC TESTING

NAS8-36298

U.S. POLYMERIC O.E. 71108

WCA Fabric for NASA Lot# 2 (KAISER)

1a. Breaking Strength, lbs/in, WARP
ASTM D1682

	#2-2S	#2-2E	#2-3S	#2-3E	LOT2 AVG
PICK	55	60	37	40	48.0
CENTER	47	75	46	54	55.5
PLAIN	51	48	54	63	54.0
AVG.	51.0	61.0	45.7	52.3	52.5

1b. Breaking Strength, lbs/inch, FILL
ASTMD 1682

PICK	21	26	24	13	21.0
CENTER	21	20	19	17	19.3
PLAIN	29	23	28	28	27.0
AVG.	23.7	23.0	23.7	19.3	22.4

2a. Carbon Assay, %
MDQAI 5560

PICK	99.7	99.6	99.3	99.4	99.50
CENTER	99.8	99.8	99.9	99.8	99.83
PLAIN	99.7	99.4	99.5	99.5	99.53
AVG.	99.73	99.6	99.57	99.57	99.62

2b. Hydrogen Assay, %
MDQAI 5560

PICK	.02	<.01	<.01	.01	EST .008
CENTER	.01	<.01	<.01	<.01	EST .003
PLAIN	.01	.02	<.01	.01	EST .010
AVG.	.013	EST .007	EST .001	EST .007	EST .007

2c. Nitrogen Assay, %
MDQAI 5560

PICK	.1	.2	.02	<.05	EST .083
CENTER	.1	.2	.01	.1	.103
PLAIN	.1	<.05	.10	<.05	EST .055
AVG.	.1	EST .137	.043	EST .04	EST .080

3. Visual Inspection
QCi-102

See Charts 3A-3B

HITCO MATERIALS DIVISION
700 E. DYER ROAD, SANTA ANA, CALIFORNIA 92707 • (714) 549-1101 • TWX (910) 595-1130 • FAX # (714) 549-2858-5-2437

WCA Fabric for NASA Lot# 2 (KAISER)

4. Specific Gravity, Units
PTM-84

	#2-2S	#2-2E	#2-3S	#2-3E	LOT2 AVG
	1.6315	1.5957	1.6378	1.6072	1.6181
	1.6659	1.6695	1.6194	1.6220	1.6442
	1.6139	1.6559	1.6435	1.5999	1.6283
AVG.	1.637	1.640	1.634	1.610	1.630

5. pH, Units
CTM-24B

	6.3	6.5	6.4	6.4	6.40
	6.4	6.5	6.4	6.3	6.40
AVG.	6.35	6.5	6.4	6.35	6.40

6. TGA, •C at 50% Weight Loss
CTM-51 (AIR)

SET UP# 1		SET UP# 2	
2-2S	944	2-2E	876
2-3S	950	2-3E	876
AVG.	947	AVG.	876

See Charts 6A-6D

7a. Atomic Absorption, ppm
CTM-53B

	#2-2S	#2-2E	#2-3S	#2-3E	LOT2 AVG
Na	5	12	11	15	10.8
K	1	0	0	1	0.5
Ca	7	8	7	7	7.3
Mg	1	1	0	0	0.5
Li	0	0	0	0	0.0
TOTAL	14	21	18	23	19.0

7b. Moisture Content, %
CTM-53B

	.015	.005	.060	.010	.023

7c. Ash Content, %
CTM-53B

	.000	.015	.015	.020	.012

8a. Filament diameter, microns, WARP
S.E.M. (Diameters are an average of 10 measurements)

AVERAGE	10.92	10.15	10.72	10.27	10.51
Minimum	9.20	9.20	9.60	9.25	9.21
Maximum	12.25	11.05	11.50	12.05	12.25
Std. Dev	1.12	0.60	0.56	0.84	0.84

WCA Fabric for NASA Lot# 2 (KAISER)

9a. Thread Count, per inch, WARP
PTM-5A

	#2-2S	#2-2E	#2-3S	#2-3E	LOT2 AVG
	30	29	29	29	29.3
	29	29	29	29	29.0
	29	29	30	29	29.3
	29	29	30	29	29.3
	29	29	29	29	29.0
AVG.	29.2	29.0	29.4	29.0	29.2

9b. Thread Count, per inch, FILL
PTM-5A

	21	22	22	21	21.5
	21	22	22	21	21.5
	21	22	22	21	21.5
	21	22	22	21	21.5
	21	22	22	21	21.5
AVG.	21.0	22.0	22.0	21.0	21.5

10a. Areal Weight as received, gm/4x4
PTM-3A

LEFT	2.495	2.455	2.579	2.481	2.503
CENTER	2.467	2.435	2.529	2.454	2.471
RIGHT	2.475	2.466	2.553	2.479	2.493
AVG.	2.479	2.452	2.554	2.471	2.489

10b. Volatiles as received, %
PTM-3A

LEFT	.48	.45	.39	.40	.43
CENTER	.45	.41	.40	.45	.43
RIGHT	.08	.04	.04	.00	.04
AVG.	.34	.30	.27	.28	.30

10c. Weight change on Acetone wash, %
PTM-3A

LEFT	.28	.25	.19	.20	.23
CENTER	-.04	-.08	-.08	-.04	-.06
RIGHT	-.20	-.12	-.12	-.16	-.15
AVG.	.01	.01	.00	.00	.01

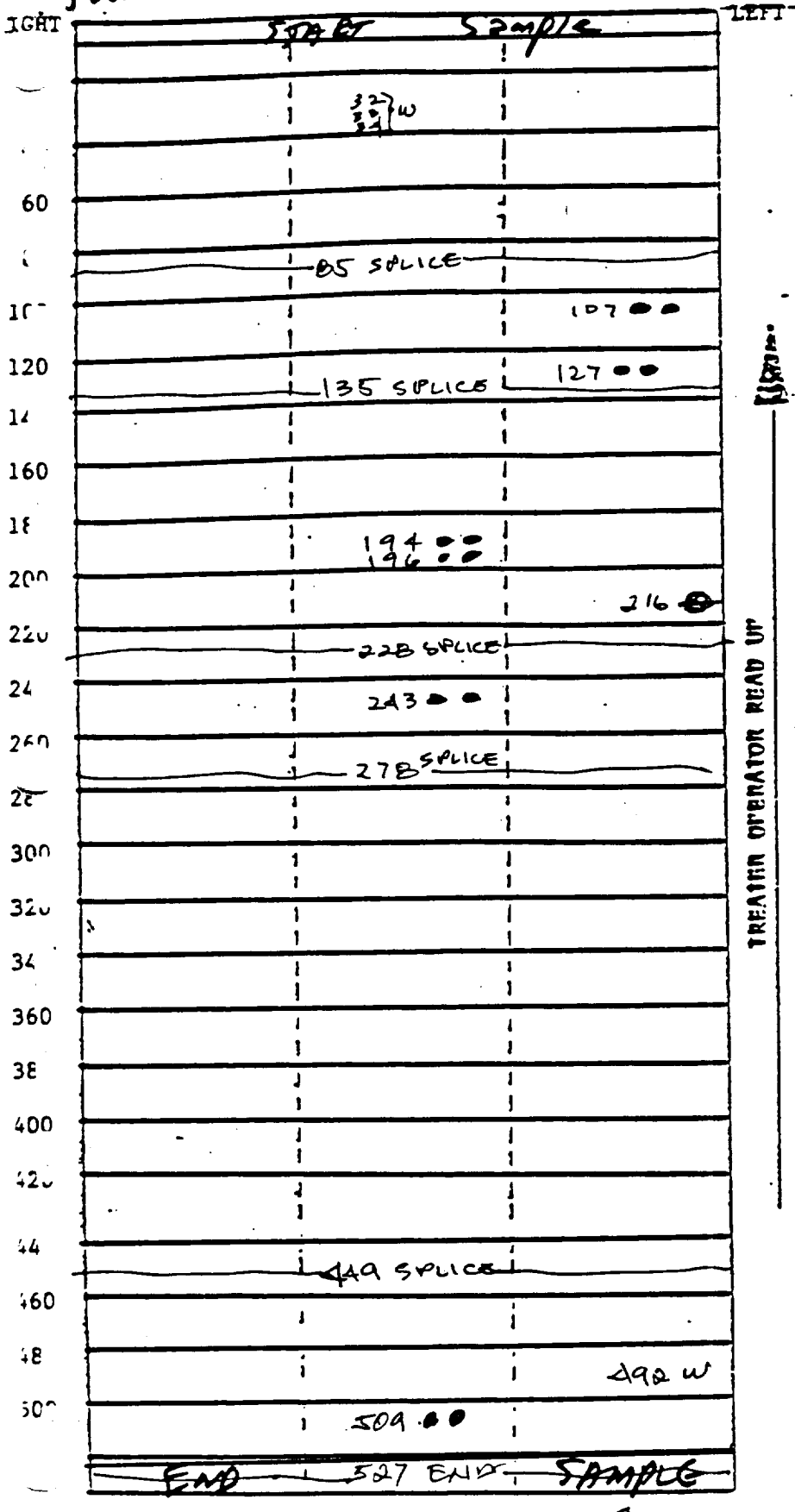
U.S. Polymeric

Hamid M. Quraishi, Manager
Quality Assurance Department

USP NO. CHART 3A

Footage

DATE 5-20-86



FABRIC WCA GRAPHITE

MFG. ~~CAR~~ UNION CARBIDE

ROLL NO. 293 4C6WCA-2

YARDS 180.0

POUNDS 99.0

ORDER NO. DE71108

SPECIFICATION VARIOUS

Q.C. FILE # NASA 2-2

SYMBOLS

- TEAR
- SPOTS OR STAINS
- FOLDS
- EDGE CURL
- TIGHT WEAVE OR SELVAGE
- WEAVE DISTORTION
- VISIBLE PUCKERS
- ONE PUCKER CREASING
- TWO OR MORE CREASINGS

REMARKS

ORIGINAL PAGE IS
OF POOR QUALITY

GRADE Group C

Kiamda

ORIGINAL PAGE IS
OF POOR QUALITY

DISP NO. — CHART 3B —

DATE 5-20-86

FOOTAGE

RIGHT — START Sample — LEFT

4 — 59 ● ●

60 — 72 SPLICE

8 — 83 △△ 82 ● ●

0 — 102 W 112 W

20 — 125 W 130 W

4 — HB WW

60

8

00 — 202 SPLICE 216 AA

20

41 — 239 WW

249 WW

81

300

320

338 ● ● — 327 WW

341 — 340 WW

360 — 369 SPLICE

381

00

20 — 430 SPLICE

41

60 — 471 ● ●

8 — 487 SPLICE

00 — END 521 END Sample

N C S

TREATER OPERATOR READ UP

FABRIC WCA GRAPHITE

MFG. UNION CARBIDE

ROLL NO. 294 4C6 WCA-2

YARDS 180 YARD

POUNDS 99.0

ORDER NO. O.E. 71108

SPECIFICATION VARIOUS

Q.C. FILE # NASA 2-3

SYMBOLS

WW - TEAR

● ● - SPOTS OR STAINS

△ △ - FOLDS

S - EDGE CURL

— - TIGHT WEAVE OR SELVAGE

W - WEAVE DISTORTION

V - VISIBLE PUCKERS

V — - ONE PUCKER CREASING

V = - TWO OR MORE CREASINGS

REMARKS

GRADE Group C

Kim Lo

CHART 6A

CHART 6B

ORIGINAL PAGE IS
OF POOR QUALITY

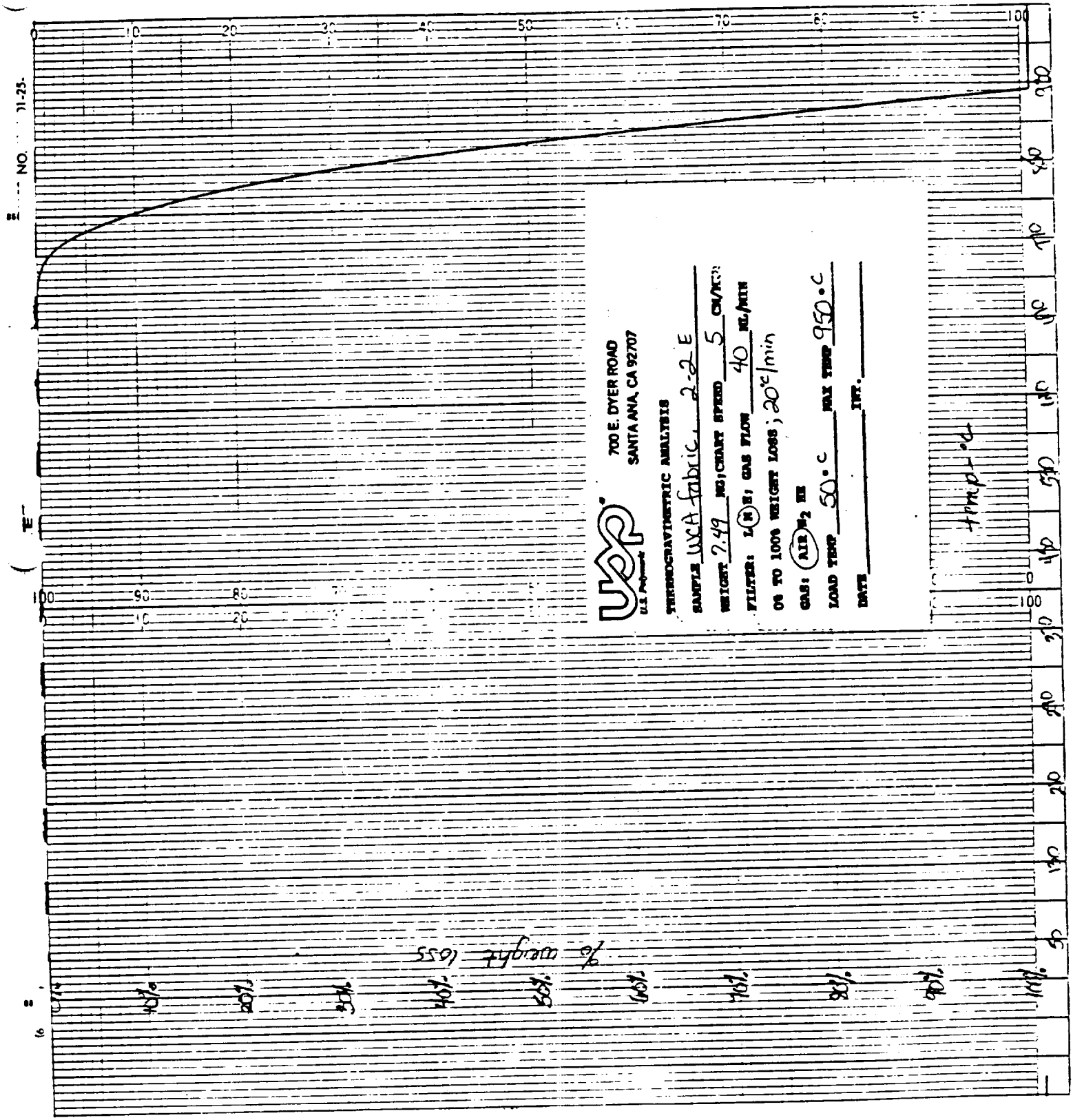


CHART 6C

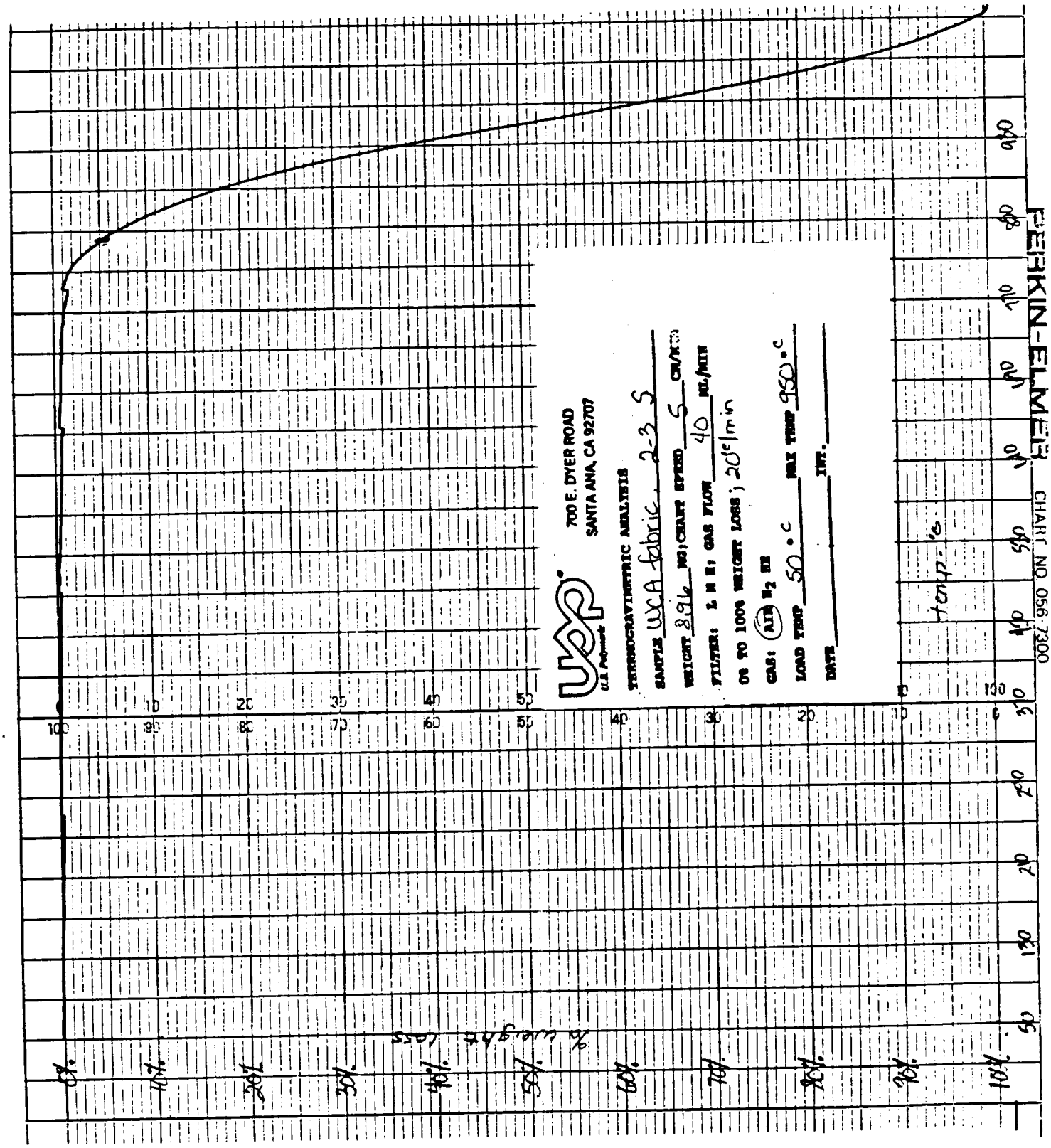


CHART 6D

TABLE OF CONTENTS

PREPREG TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

FM 5064J NASA LOT# 2 U.S.P. LOT# D09280 (KAISER)

CHARTS

U.S. Polymeric

PREPREG TESTING

NAS8-36298

U.S. POLYMERIC O.E. 71108

FM 5064J NASA LOT# 2 U.S.P. LOT# D09280 (KAISER)

1a. Resin Content, Soxhlet, %
CTM-6D

	ROLL#1 START	ROLL#1 END	ROLL#2 START	ROLL#2 END	ROLL#3 START	ROLL#3 END
	33.4	33.6	33.9	35.6	33.3	33.9
	32.6	34.5	33.5	34.8	33.6	33.1
	32.2	34.4	34.3	32.8	32.4	33.0
AVG.	32.7	34.2	33.9	34.4	33.1	33.3
				NASA LOT# 2	AVERAGE	33.6

1b. Filler Content, Soxhlet, %
CTM-6D

	13.7	13.8	13.9	14.6	13.7	13.9
	13.4	14.2	13.7	14.3	13.8	13.6
	13.2	14.1	14.1	13.5	13.3	13.5
AVG.	13.4	14.0	13.9	14.1	13.6	13.7
				NASA LOT# 2	AVERAGE	13.8

1c. Cloth Content, Soxhlet, %
CTM-6D

	52.9	52.6	52.2	49.8	53.0	52.2
	54.0	51.3	52.8	50.9	52.6	53.3
	54.6	51.5	51.6	53.7	54.3	53.5
AVG.	53.8	51.8	52.2	51.5	53.3	53.0
				NASA LOT# 2	AVERAGE	52.6

2. Volatile Content, %
PTM-17B

	2.7	2.5	2.3	2.5	2.4	2.6
	2.7	2.6	2.5	2.5	2.5	2.4
	2.8	2.7	2.7	2.6	2.5	2.3
AVG.	2.7	2.6	2.5	2.5	2.5	2.4
				NASA LOT# 2	AVERAGE	2.5

3. Flow, 1000 psi, %
PTM-19G

	18.2	17.2	17.0	16.8	17.8	15.3
	17.8	17.8	16.7	16.1	17.5	16.0
	17.9	17.4	17.7	17.0	16.6	15.5
AVG.	18.0	17.5	17.1	16.6	17.3	15.6
				NASA LOT# 2	AVERAGE	17.0

HITCO MATERIALS DIVISION
700 E. DYER ROAD, SANTA ANA, CALIFORNIA 92707 • (714) 549-1101 • TWX (910) 595-1130 • FAX # (714) 549-2858-5-2437

FM 5064J NASA LOT# 2 U.S.P. LOT# D09280 (KAISER)

4. Resin Content, Dry Basis, %
PTM-16F, Type II

	ROLL#1 START	ROLL#1 END	ROLL#2 START	ROLL#2 END	ROLL#3 START	ROLL#3 END
	33.5	34.6	34.8	34.6	33.8	33.8
	33.3	35.1	35.3	35.2	34.6	33.2
	34.1	35.8	35.8	35.3	34.4	33.3
AVG.	33.6	35.2	35.3	35.0	34.3	33.4

NASA LOT# 2 AVERAGE 34.5

5. Tack, lbs
PTM-80

46	40	36	26	30	24

NASA LOT#2 AVERAGE 34

6. Gel Time, Seconds
PTM-20E

75	61	58	87	78	54

NASA LOT# 2 AVERAGE 69

7a. Atomic Absorption, ppm
CTM-53B

	ROLL#1 START	ROLL#1 END	ROLL#2 START	ROLL#2 END	ROLL#3 START	ROLL#3 END	LOT#2 AVG.
Na	6	7	6	8	7	6	7
K	0	1	1	1	1	1	1
Ca	7	9	7	13	8	12	9
Mg	1	2	1	2	2	2	2
Li	0	0	0	0	0	0	0
TOTAL	14	19	15	24	18	21	19

7b. Moisture Content, %
CTM-53B

ROLL#1 START	ROLL#1 END	ROLL#2 START	ROLL#2 END	ROLL#3 START	ROLL#3 END
1.93	2.03	1.99	1.92	1.89	1.78

NASA LOT# 2 AVERAGE 1.92

7c. Ash Content, %
CTM-53B

.03	.05	.08	.02	.03	.06

NASA LOT# 2 AVERAGE .04

FM 5064J NASA LOT# 2 U.S.P. LOT# D09280 (KAISER)

8. TGA, % Weight Loss at 500°C
CTM-51 (Nitrogen)

ROLL#1 START	ROLL#1 END	ROLL#2 START	ROLL#2 END	ROLL#3 START	ROLL#3 END
8.7	9.3	9.2	9.3	8.6	9.8

NASA LOT# 2 AVERAGE 9.2

See Chart 8A-8F

9. DSC, °C
CTM-50A

183	184	184	185	184	183

NASA LOT# 2 AVERAGE 184

See Chart 9A-9F

10. Infrared (IRZB) Baseline
CTM-21C

.83	.82	.81	.80	.78	.77

NASA LOT# 2 AVERAGE .80

See Chart 10A-10F

11. Environmental History

Date manufactured: 30 May 1986
Packaged in: MIL-B-131 Class I bag supported in cardboard carton
Date shipped: 31 July 1986 in 40°F truck

12. Specific Gravity, Cured, Units
ASTM D 792

	1.431	1.435	1.432	1.435	1.433	1.432
	1.430	1.433	1.432	1.435	1.432	1.430
	1.430	1.433	1.432	1.435	1.433	1.430
AVG.	1.430	1.434	1.432	1.435	1.432	1.431

NASA LOT# 2 AVERAGE 1.432

13a. Tensile Strength, ksi, WARP
FTMS 406-1011

	18.74	18.64	19.84	20.24	18.59	19.64
	18.88	20.26	19.20	18.37	19.69	18.91
	21.49	19.20	19.12	18.66	19.94	18.20
	20.07	18.20	19.04	19.66	17.38	19.34
	21.17	18.72	18.86	18.29	20.76	18.48
AVG.	20.07	19.00	19.21	19.04	19.27	18.91

NASA LOT# 2 AVERAGE 19.25

FM 5064J NASA LOT# 2 U.S.P. LOT# D09280 (KAISER)

13b. Tensile Modulus, msi, WARP
FTMS 406-1011

	ROLL#1 START	ROLL#1 END	ROLL#2 START	ROLL#2 END	ROLL#3 START	ROLL#3 END
	2.15	2.14	2.21	2.09	2.21	2.46
	2.19	2.12	2.18	2.04	2.10	2.54
	2.06	1.98	2.21	2.14	2.33	2.47
	2.32	2.13	2.02	2.08	2.09	2.25
	2.22	2.01	2.11	2.16	2.14	2.14
AVG.	2.19	2.08	2.15	2.10	2.17	2.37
				NASA LOT# 2	AVERAGE	2.18

13c. Tensile Elongation, %, WARP
FTMS 406-1011

	1.00	1.10	1.16	1.09	1.05	1.02
	.87	1.23	1.18	1.12	1.22	.96
	1.09	1.04	.99	1.10	1.14	.94
	.93	1.00	1.14	1.08	1.07	.88
	1.15	1.06	1.02	1.05	1.29	1.03
AVG.	1.01	1.09	1.10	1.09	1.15	.97
				NASA LOT# 2	AVERAGE	1.07

14a. Flexural Strength, Ksi, WARP
FTMS 406-1031

	28.36	28.03	28.20	29.18	31.72	27.38
	29.22	29.56	28.52	35.07	30.60	26.91
	29.15	28.84	27.17	33.20	31.62	26.57
	28.46	29.81	29.68	32.07	32.55	25.98
	30.25	30.04	29.20	29.76	32.24	25.68
AVG.	29.09	29.26	28.55	31.86	31.75	26.50
				NASA LOT# 2	AVERAGE	29.50

14b. Flexural Modulus, msi, WARP
FTMS 406-1031

	2.19	2.06	2.03	2.11	2.11	1.86
	2.34	2.05	2.01	2.28	2.19	1.98
	2.15	1.93	2.02	2.13	2.06	1.87
	2.04	2.05	1.95	2.23	2.24	1.96
	2.25	2.03	1.88	2.11	2.15	1.90
AVG.	2.19	2.02	1.98	2.17	2.15	1.91
				NASA LOT# 2	AVERAGE	2.07

FM 5064J NASA LOT# 2 U.S.P. LOT# D09280 (KAISER)

15a. Compressive Strength, ksi, WARP
FTMS 406-1021

	ROLL#1 START	ROLL#1 END	ROLL#2 START	ROLL#2 END	ROLL#3 START	ROLL#3 END
	22.11	22.55	17.04	24.22	25.35	20.23
	19.69	19.48	23.02	18.64	24.50	19.61
	20.84	24.58	23.02	20.68	24.83	18.35
	18.34	23.89	23.54	25.67	23.67	20.27
	20.81	22.74	23.56	24.19	24.20	20.00
AVG.	20.36	22.65	22.04	22.68	24.51	19.69

NASA LOT# 2 AVERAGE 21.99

15b. Compressive Modulus, msi, WARP
FTMS 406-1021

	2.05	2.02	2.13	2.20	2.05	2.08
	2.03	2.08	2.10	2.29	1.99	2.20
	2.09	2.06	2.05	2.35	2.14	2.20
	2.14	2.04	2.05	2.23	2.00	2.12
	2.02	2.00	2.03	2.21	2.06	2.27
AVG.	2.07	2.04	2.07	2.26	2.05	2.17

NASA LOT# 2 AVERAGE 2.11

16. Double Shear Strength, ksi
FTMS 406-1041A

	2.40	2.87	2.60	2.69	2.15	2.70
	2.47	3.07	2.96	2.51	2.42	2.43
	2.56	2.93	2.79	2.91	2.49	2.59
	2.43	2.72	2.77	2.60	2.41	2.58
	2.68	2.76	2.66	2.60	2.37	2.55
AVG.	2.51	2.87	2.75	2.66	2.36	2.57

NASA LOT# 2 AVERAGE 2.62

17. Barcol Hardness, Units
ASTM D-2583
(Average of 10 determinations)

59.2	59.9	57.1	55.2	63.0	60.6

NASA LOT# 2 AVERAGE 59.2

18. Residual Volatiles, %
PTM-98

	1.31	1.32	1.34	1.50	1.31	1.28
	1.45	1.29	1.35	1.31	1.34	1.29
	1.32	1.46	1.51	1.37	1.33	1.29
AVG.	1.36	1.36	1.40	1.40	1.33	1.29

NASA LOT# 2 AVERAGE 1.35

FM 5064J NASA LOT# 2 U.S.P. LOT# D09280 (KAISER)

19. Resin Content, Pyrolysis, %
CTM-14B

	ROLL#1 START	ROLL#1 END	ROLL#2 START	ROLL#2 END	ROLL#3 START	ROLL#3 END
	29.70	31.74	32.23	31.64	31.92	30.67
	30.11	33.43	33.15	32.19	31.72	30.38
	31.13	32.96	31.89	32.06	31.53	30.46
AVG.	30.32	32.71	32.42	31.96	31.72	30.50
				NASA LOT# 2	AVERAGE	31.61

20. Acetone Extraction, %
CTM-18A

	4.55	5.78	6.19	5.23	5.61	5.33
	5.15	6.14	4.56	4.49	6.25	4.48
	5.40	6.87	5.02	5.77	5.00	4.83
AVG.	5.03	6.26	5.26	5.17	5.62	4.88
				NASA LOT# 2	AVERAGE	5.37

21a. CTE, in/in •F, with PLY
PTM-61B

	2.66	3.06	3.80	2.71	2.77	2.96
	2.94	3.92	4.14	2.73	1.96	2.41
AVG.	2.80	3.49	3.97	2.72	2.37	2.69
				NASA LOT# 2	AVERAGE	3.01

21b CTE, in/in •F, Cross PLY
PTM-61B

	7.21	6.15	6.66	2.88	3.05	3.34
	3.45	4.18	4.24	3.12	2.13	3.83
AVG.	5.33	5.17	5.45	3.00	2.59	3.59
				NASA LOT# 2	AVERAGE	4.19

See Chart 21A-21F

U.S. Polymeric

Hamid M. Qureishi, Manager
Quality Assurance Department

CHART 8A

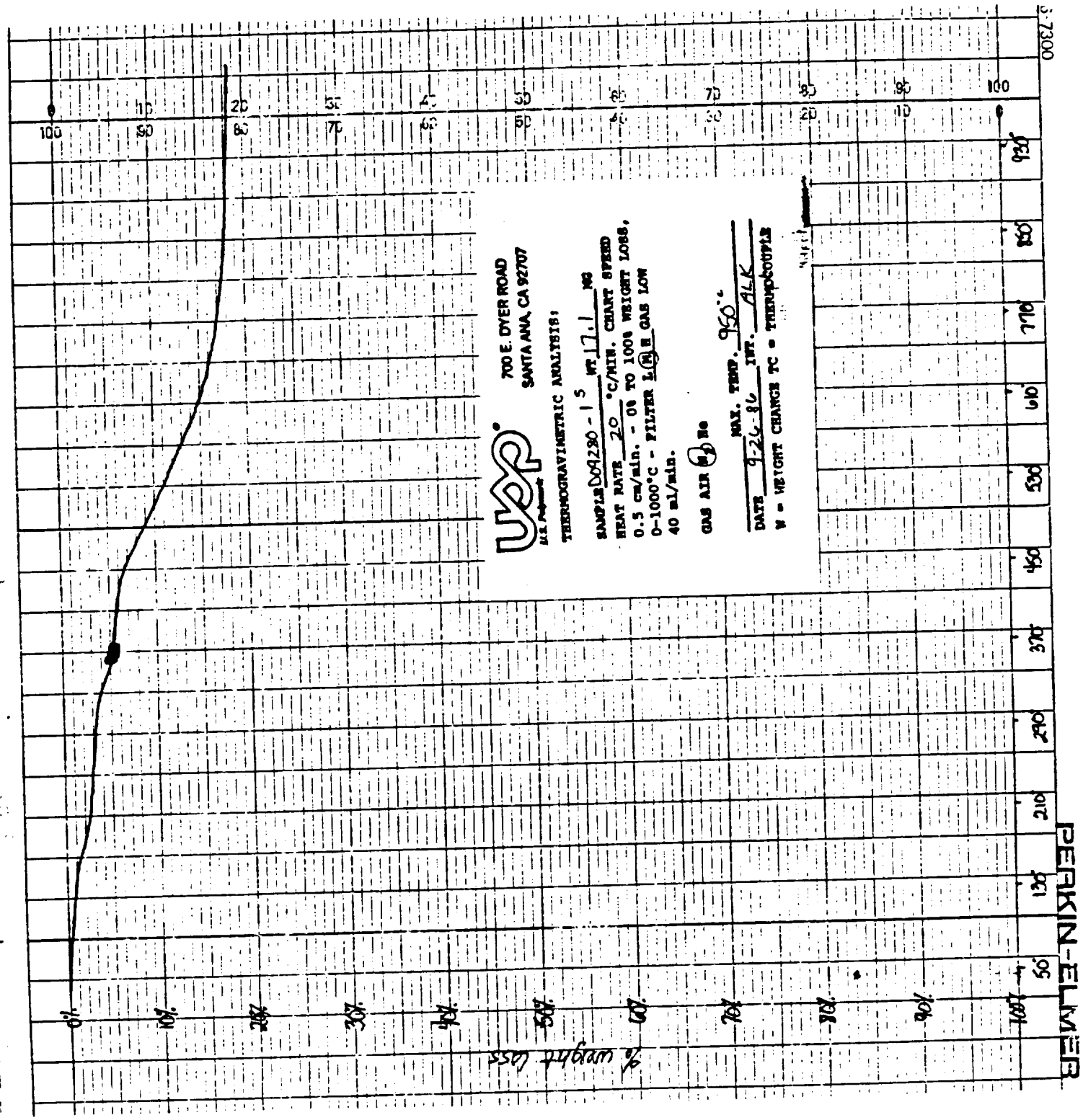


CHART 8B

ORIGINAL PAGE IS
OF POOR QUALITY

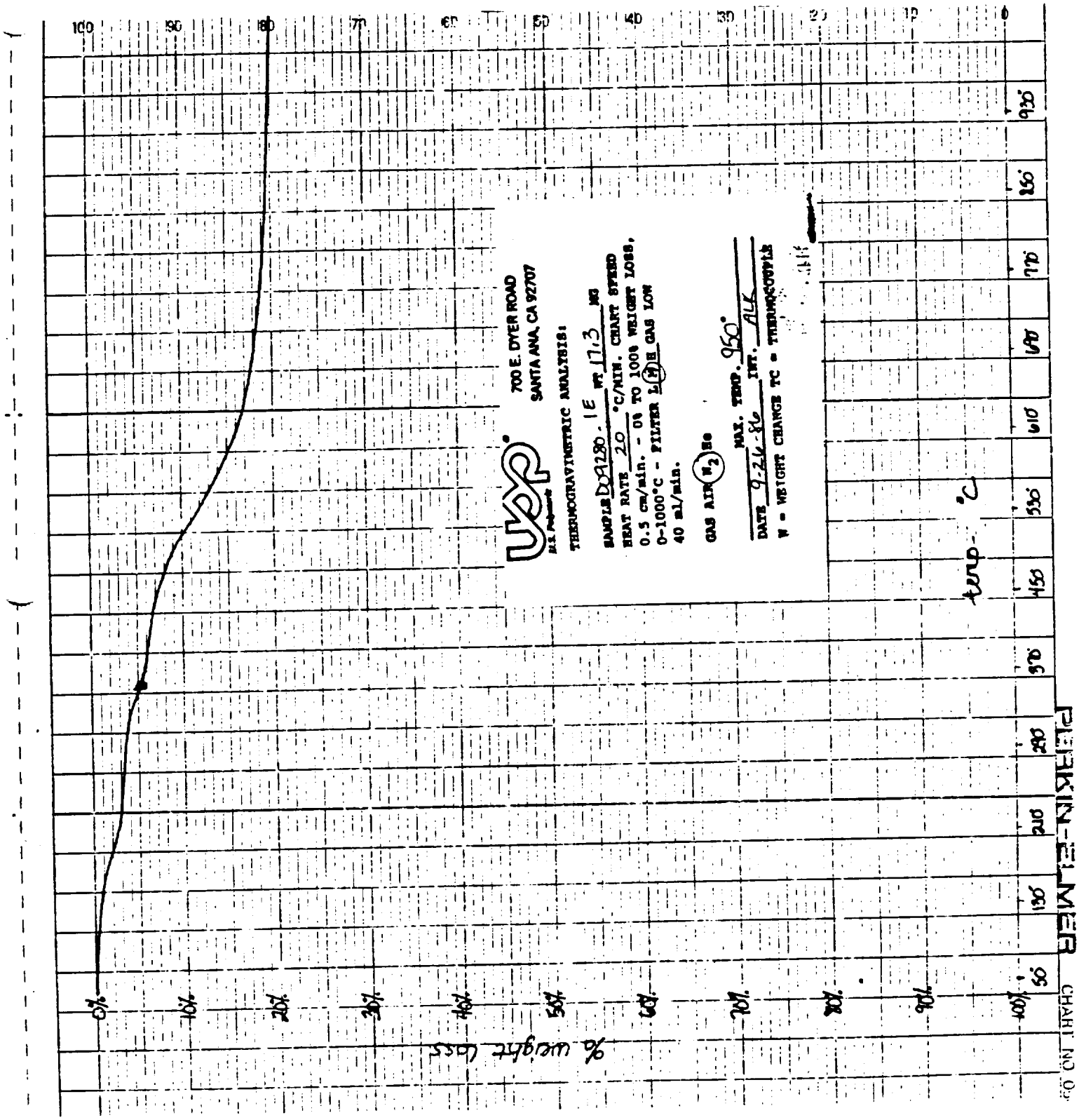
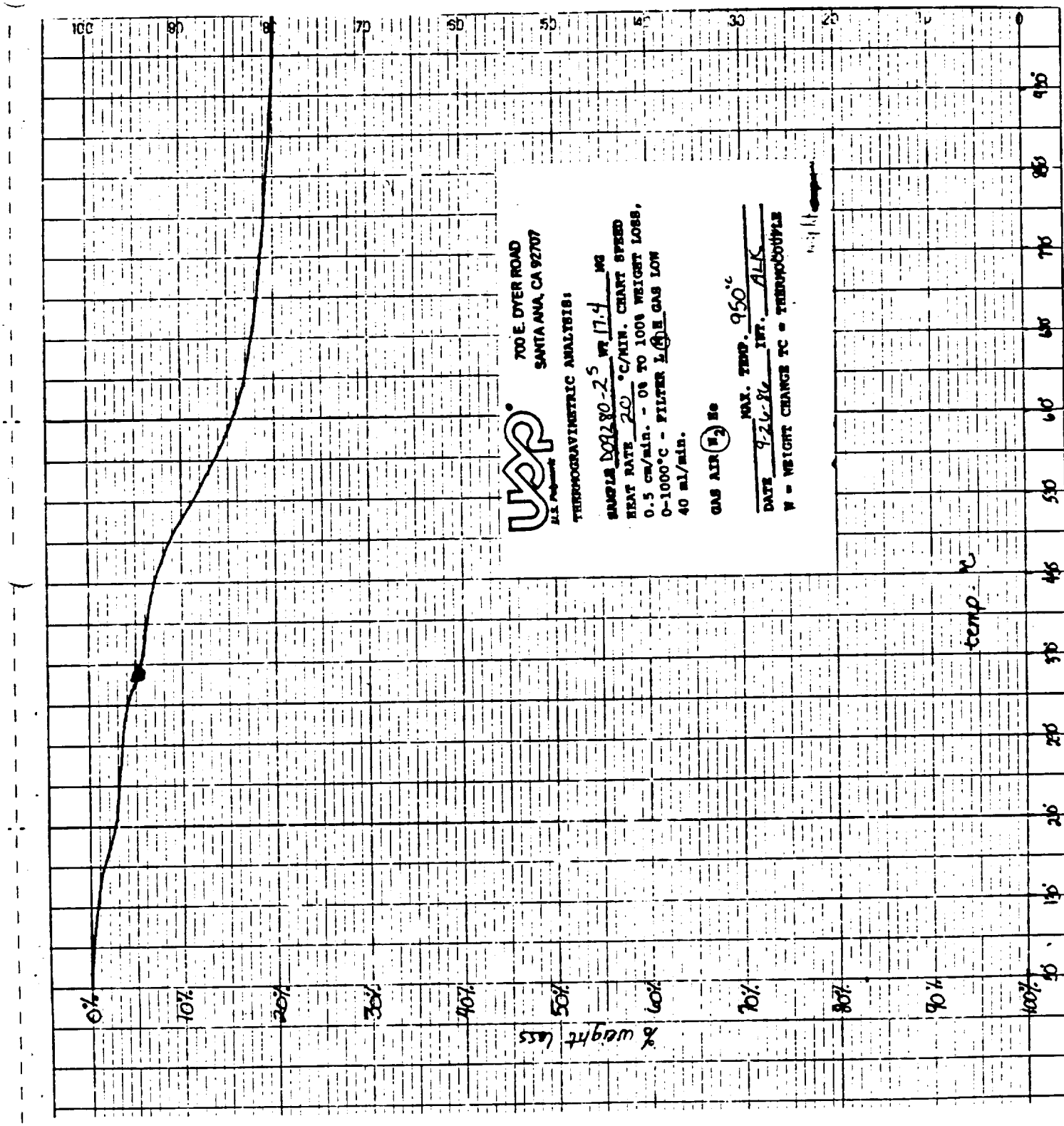


CHART 8C



ORIGINAL PAGE IS
OF POOR QUALITY

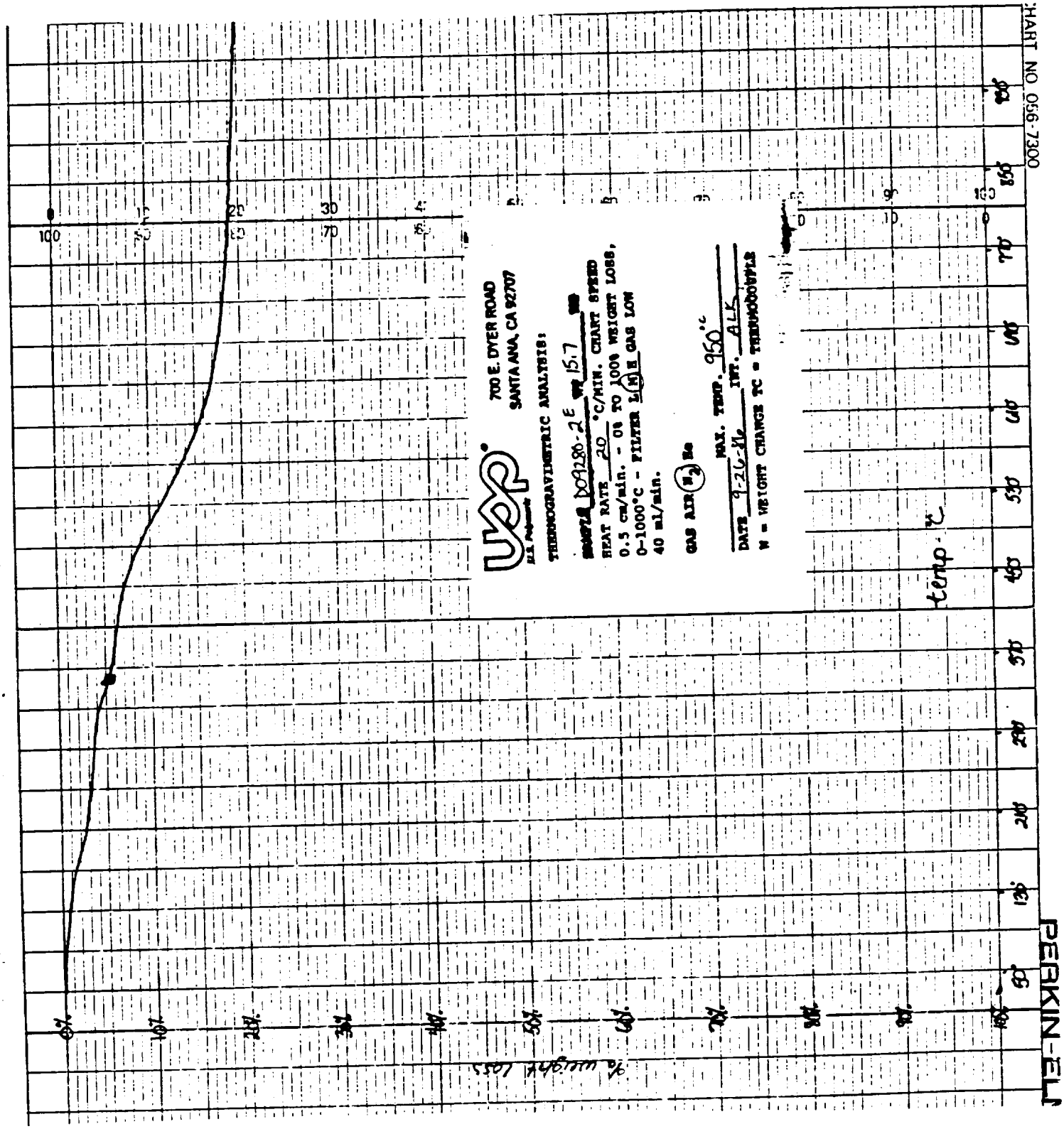
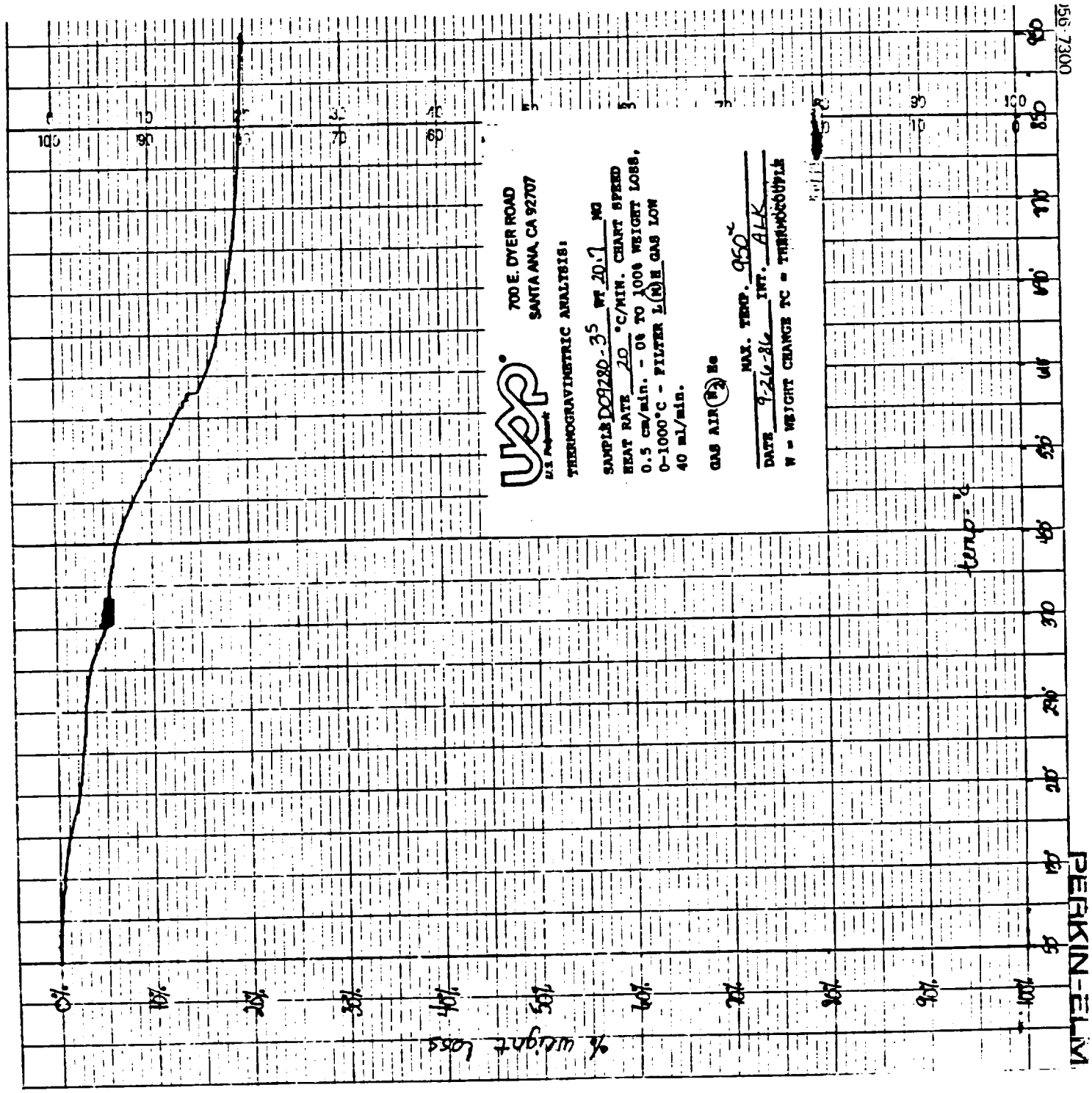


CHART 8E



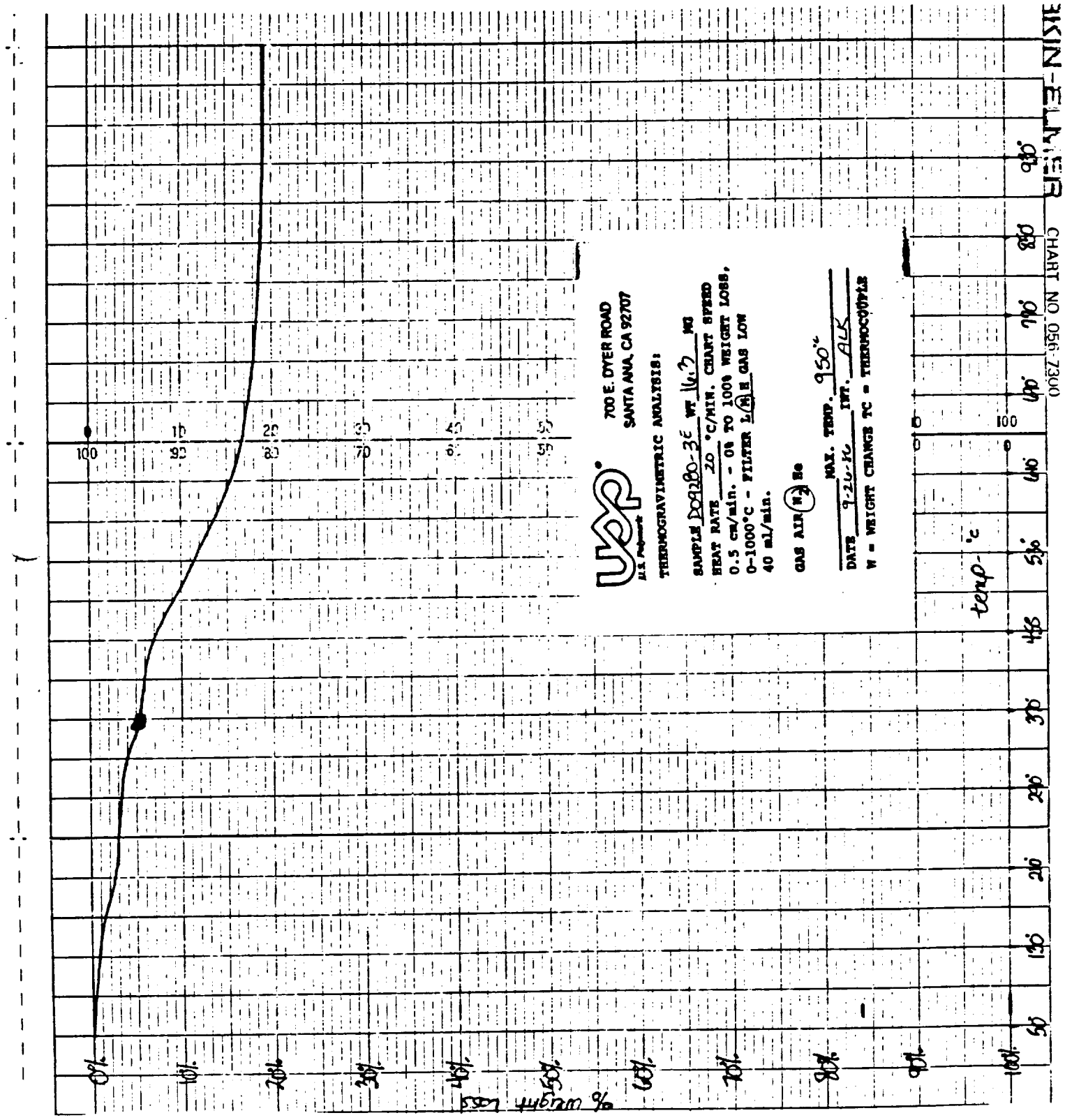


CHART 9A

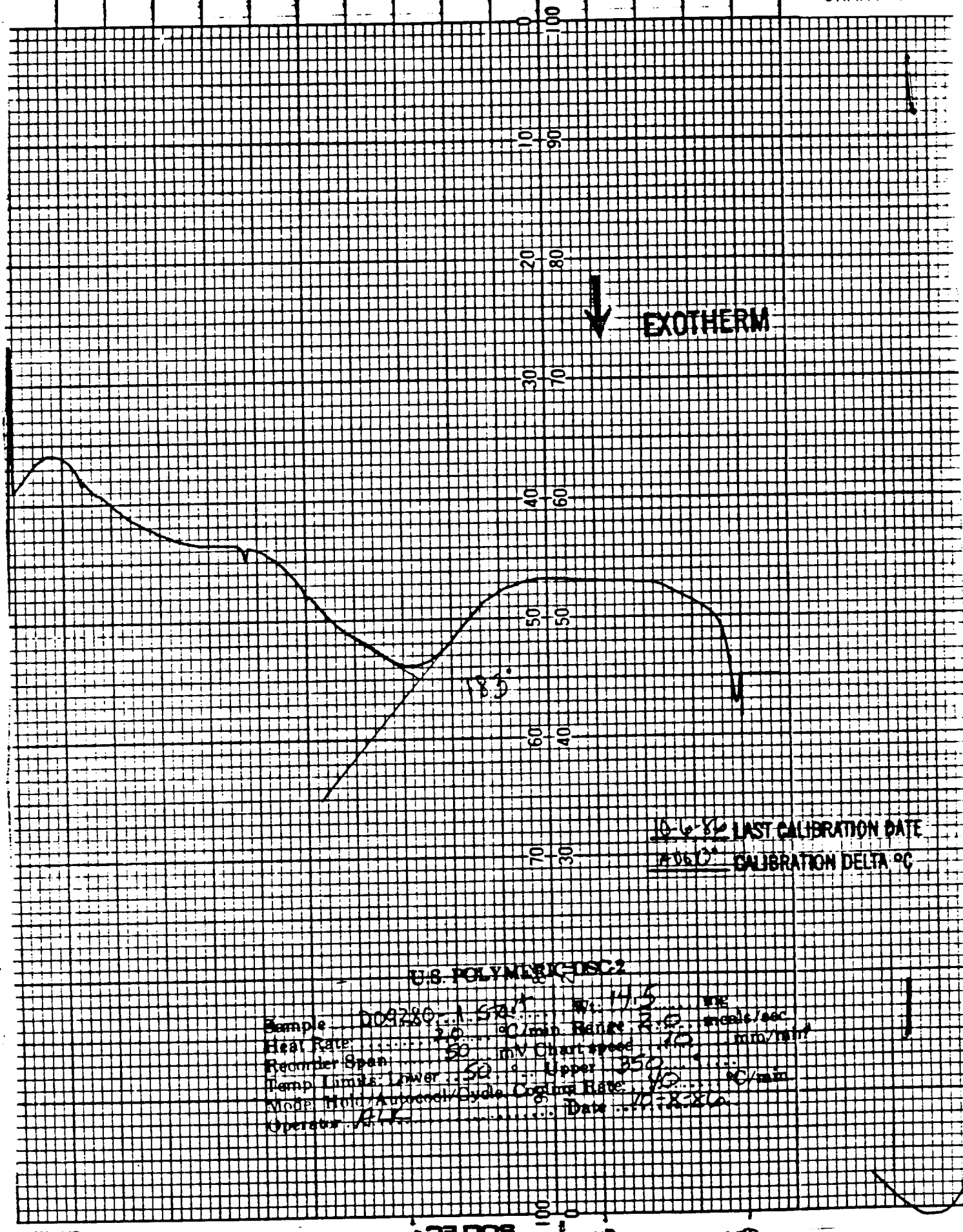
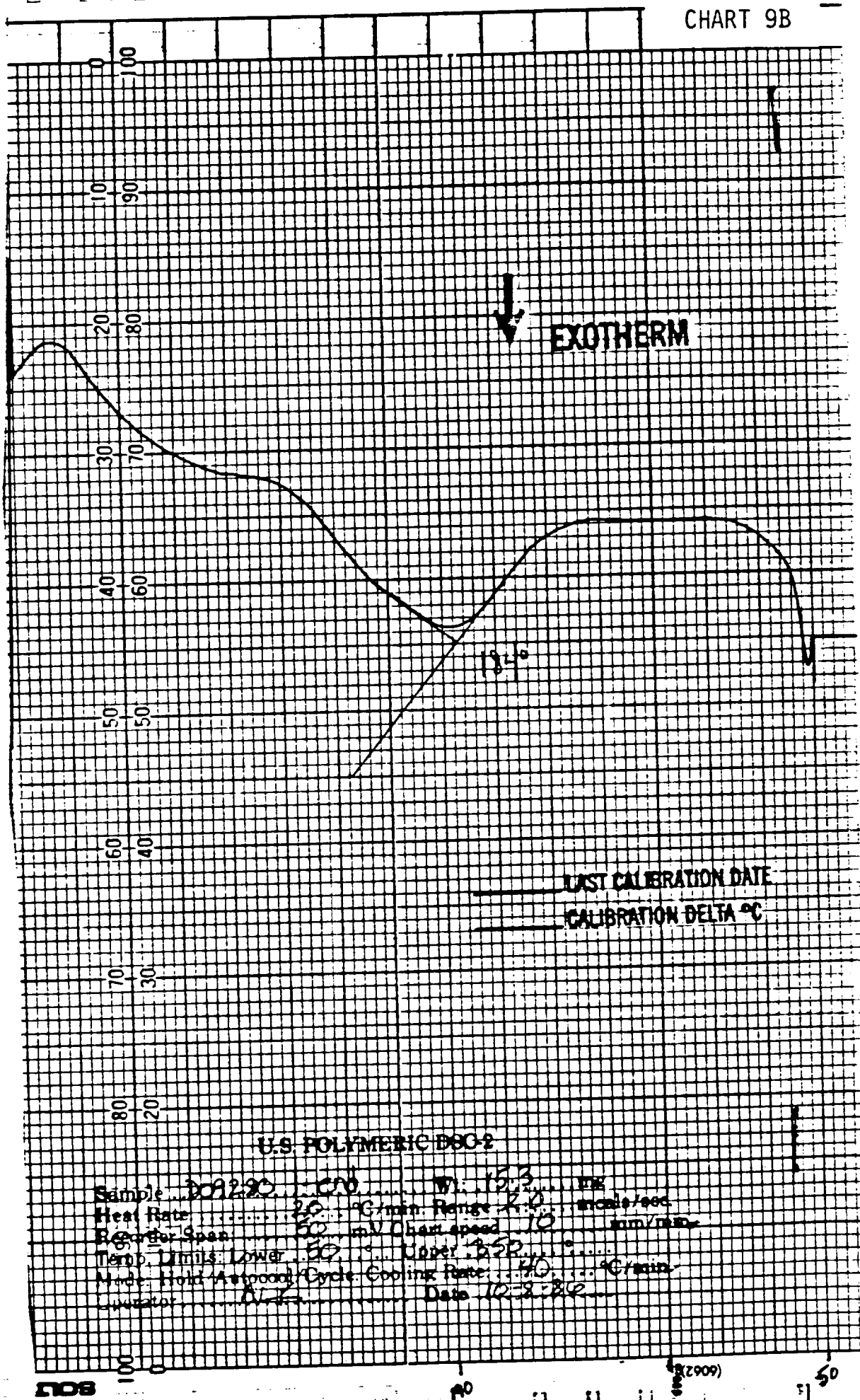


CHART 9B



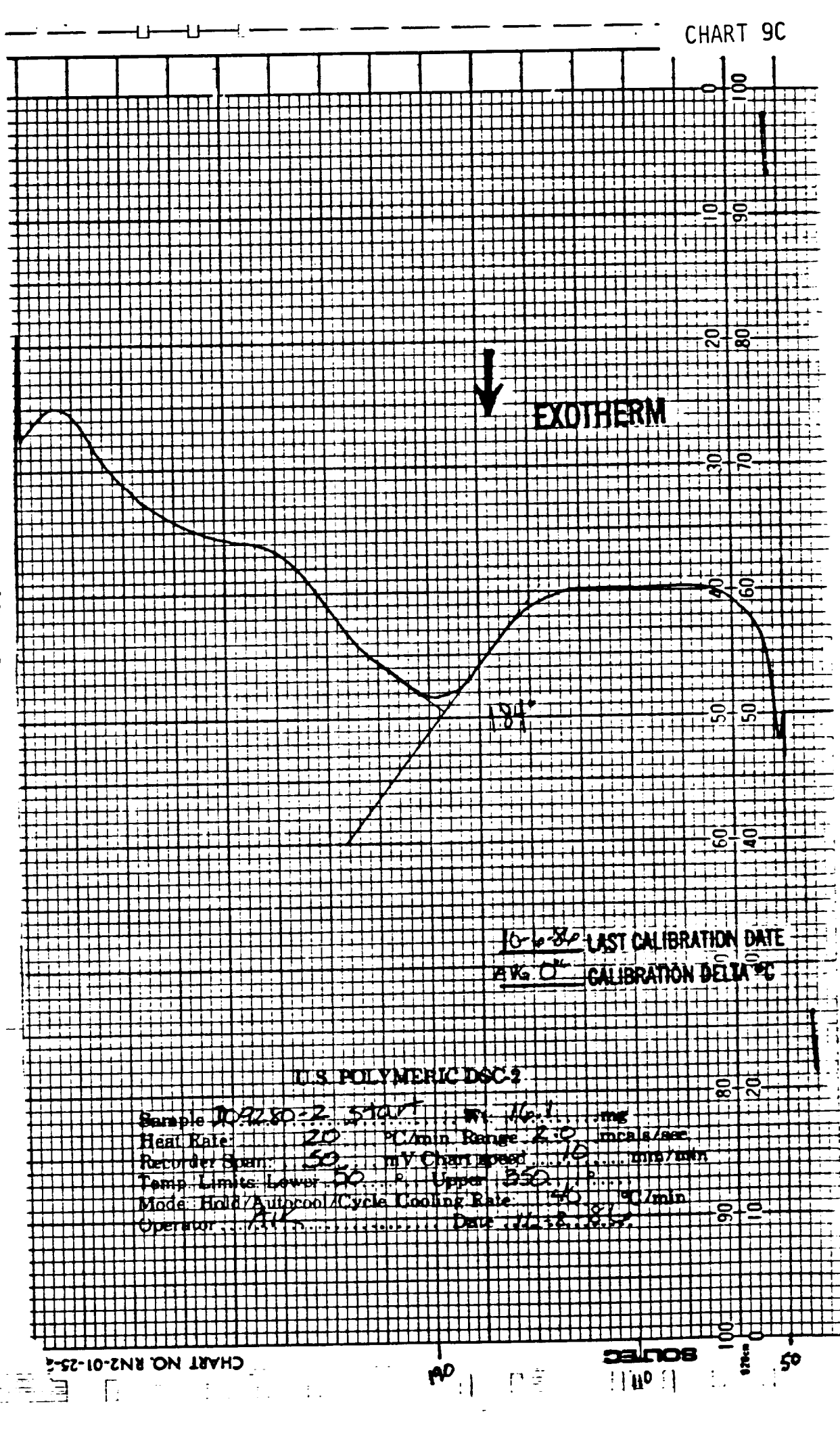
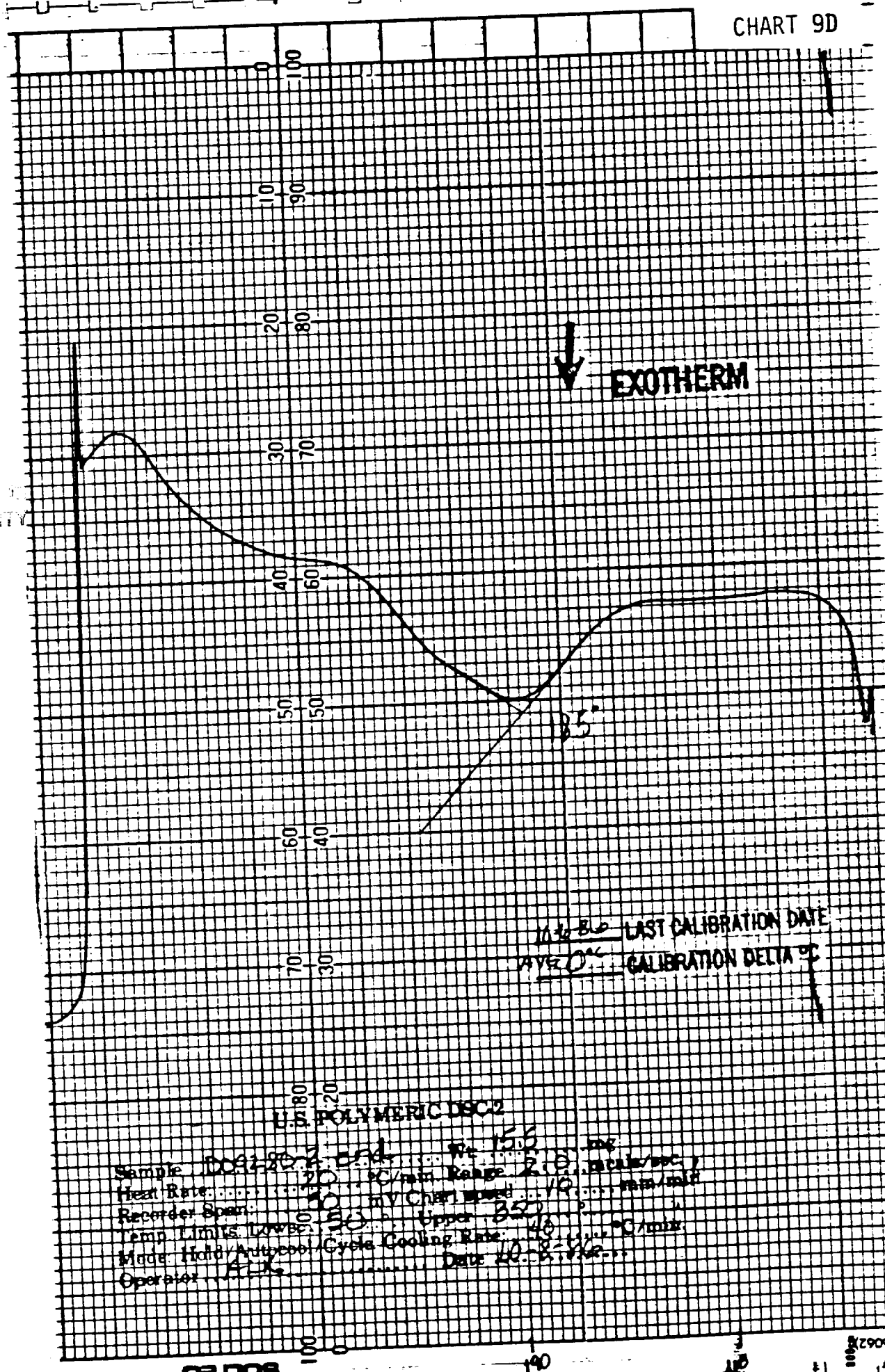


CHART 9D



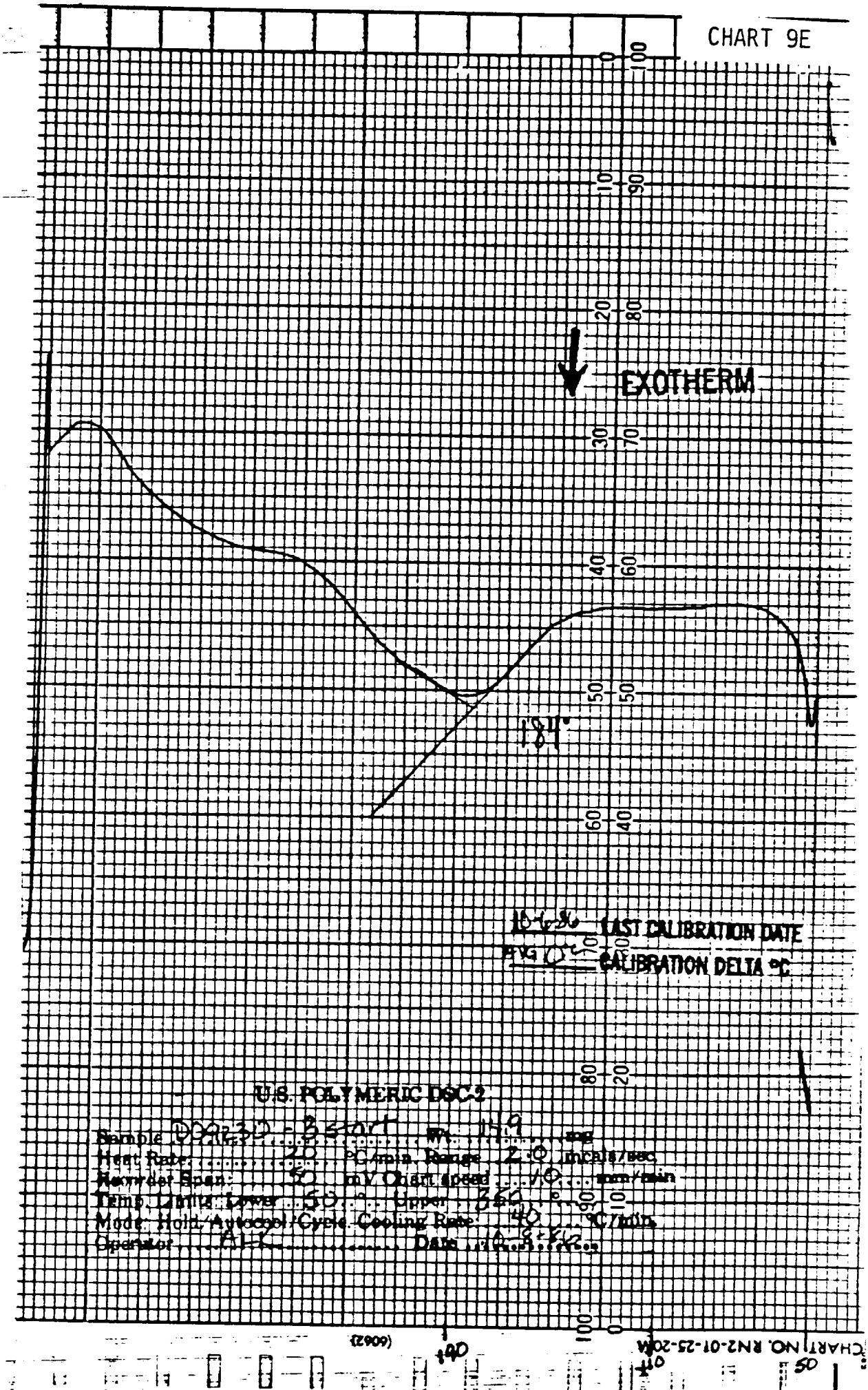
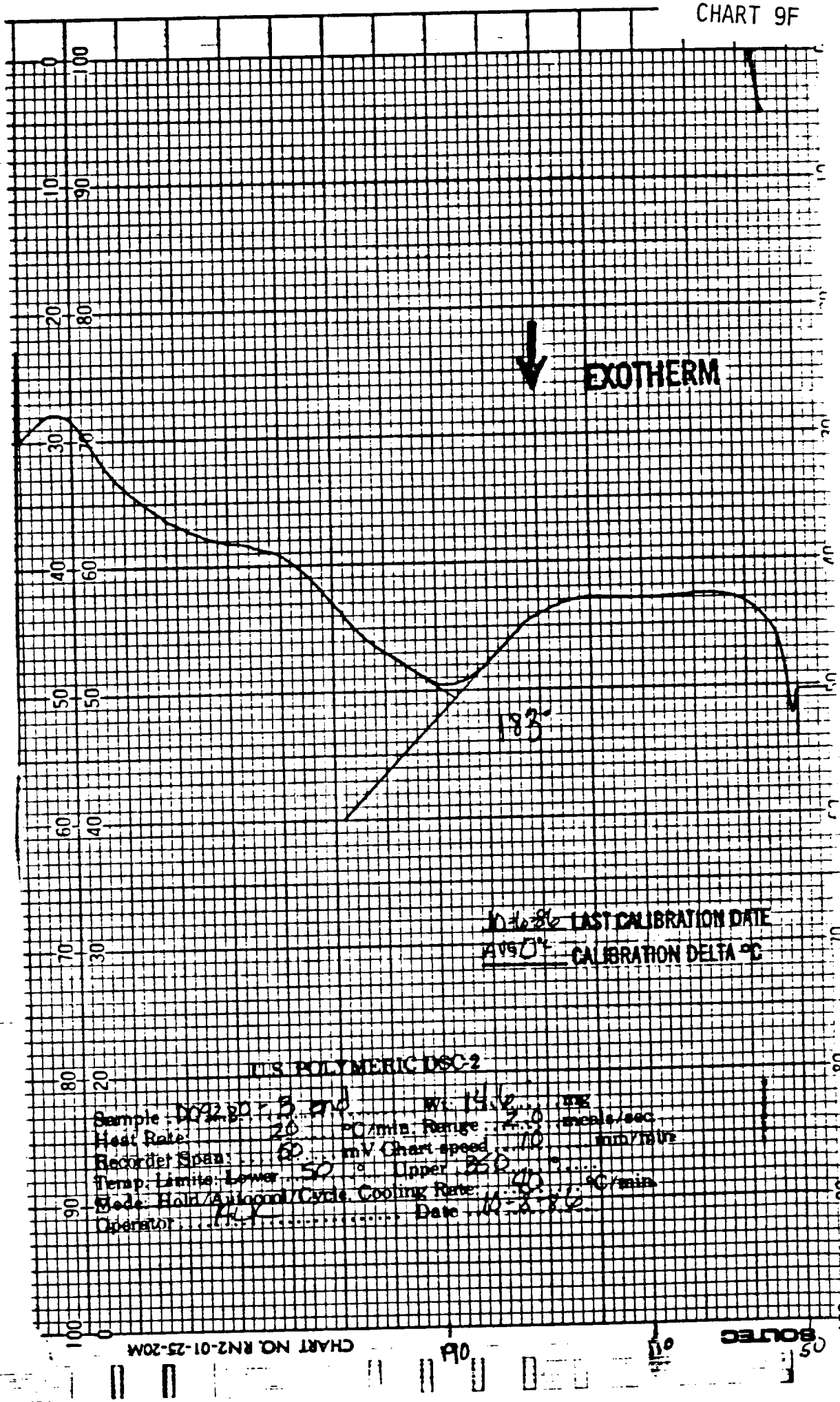


CHART 9F



ORIGINAL PAGE IS
OF POOR QUALITY

SPECTRUM NO. 15189
DATE 7-07-86
SAMPLE FM 5064 J
D09280 # ST-1

SOURCE

STRUCTURE

PATH 0.1 mm NACL
SOLVENT ACETONE
CONCENTRATION 30-50%
PHASE 3
COMMENTS PRE-PREG
MATERIAL

ANALYST V. MIRANDA

Beckman®

INFRARED
SPECTROPHOTOMETER

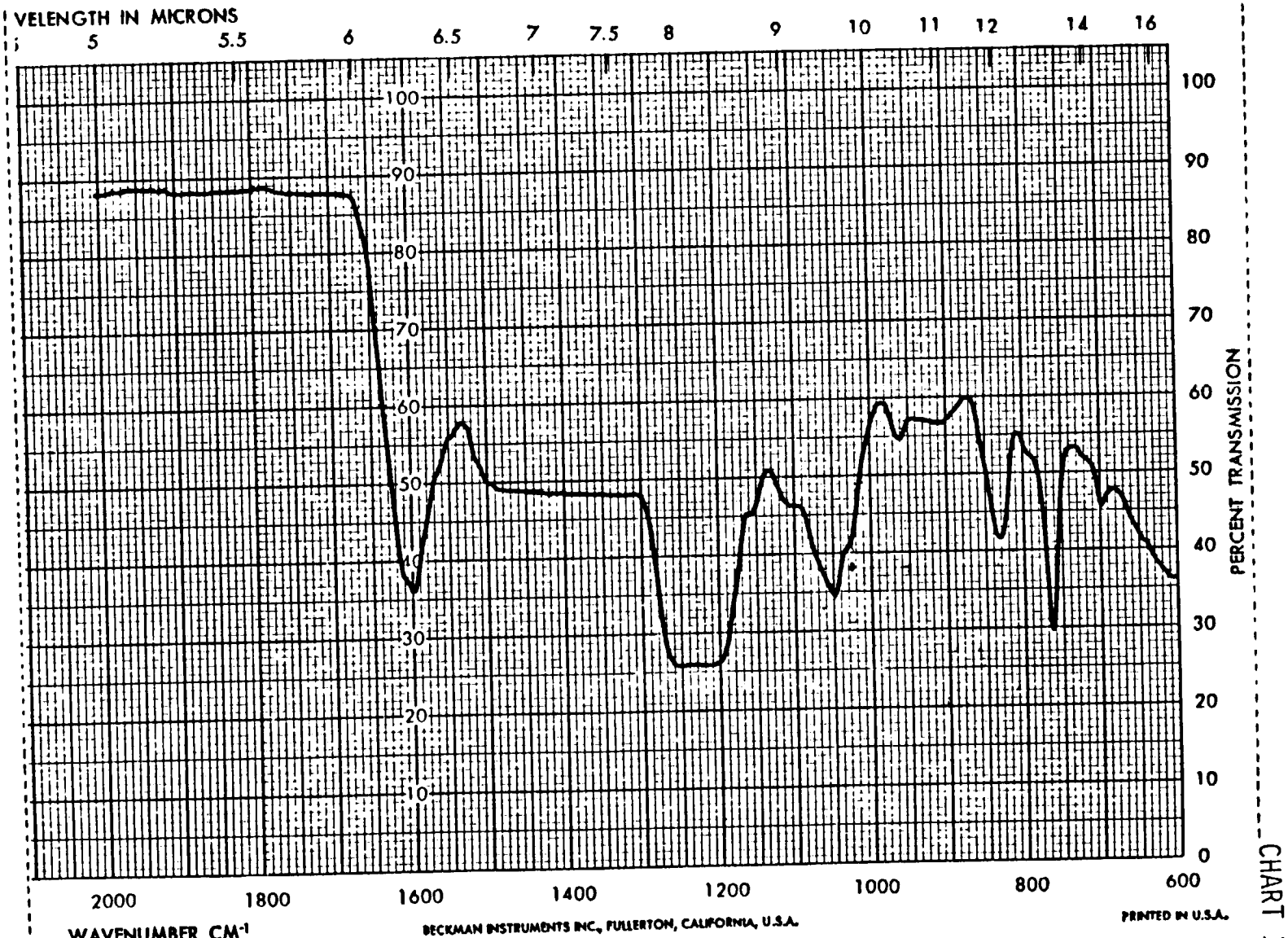
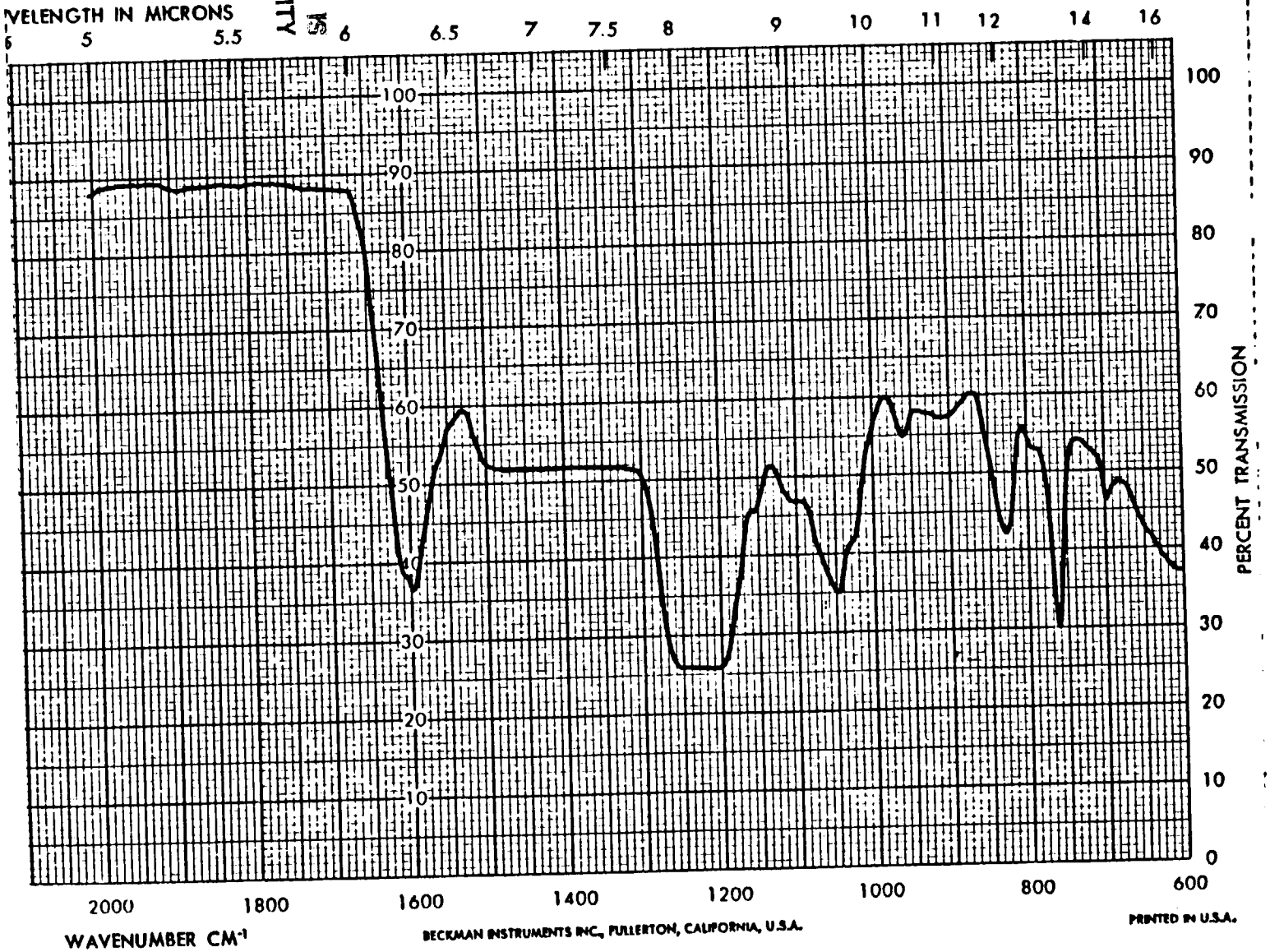


CHART 10A

SPECTRUM NO. 15190
DATE 7-03-86
SAMPLE FM 5064 J
D09280 #E-1
SOURCE
STRUCTURE

PATH 0.2 mm NACL
SOLVENT ACETONE
CONCENTRATION 30-50%
PHASE S
COMMENTS PRE-PREG
MATERIAL
ANALYST V. MIRANDA

Beckman®
INFRARED
SPECTROPHOTOMETER



BECKMAN INSTRUMENTS INC., FULLERTON, CALIFORNIA, U.S.A.
PRINTED IN U.S.A.

CHART 10B

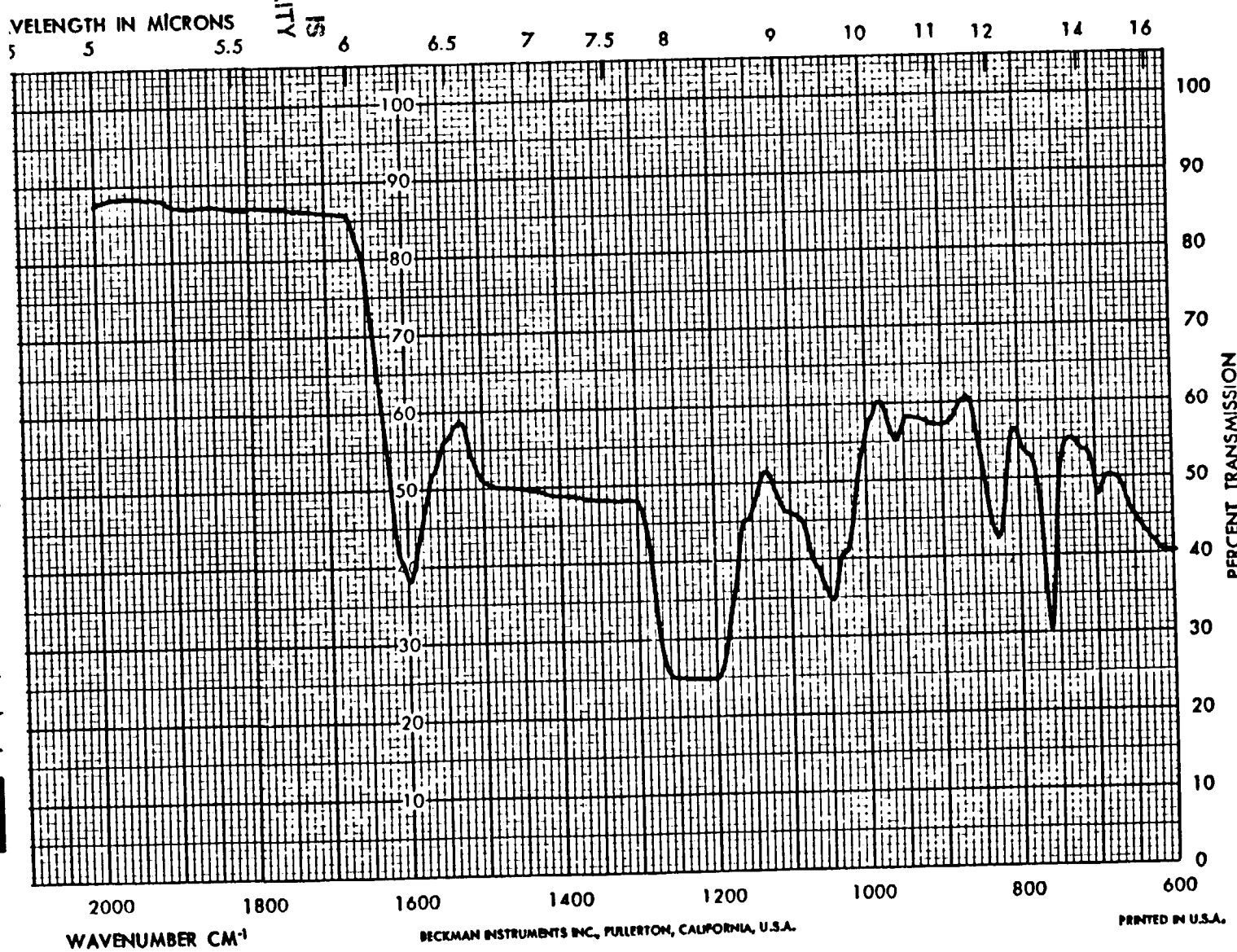
SPECTRUM NO. 15191
DATE 7-07-86
SAMPLE FM 5064 J
D092.80 #ST-2

SOURCE
STRUCTURE

PATH 0.2 mm NACL
SOLVENT ACETONE
CONCENTRATION 30-50%T
PHASE 3
COMMENTS PRE-PREG
MATERIAL

ANALYST Y. MIRANDA

Beckman®
INFRARED
SPECTROPHOTOMETER



BECKMAN INSTRUMENTS INC., FULLERTON, CALIFORNIA, U.S.A.
PRINTED IN U.S.A.

CHART 10C

SPECTRUM NO. 15192
DATE 7-07-86
SAMPLE FM 5064 J
D09280-#E-2
SOURCE
STRUCTURE

PATH 0.2 mm NACL
SOLVENT ACETONE
CONCENTRATION 30-50%T
PHASE 3
COMMENTS PRE-PROG
MATERIAL
ANALYST V. MIRANDA

Beckman®
INFRARED
SPECTROPHOTOMETER

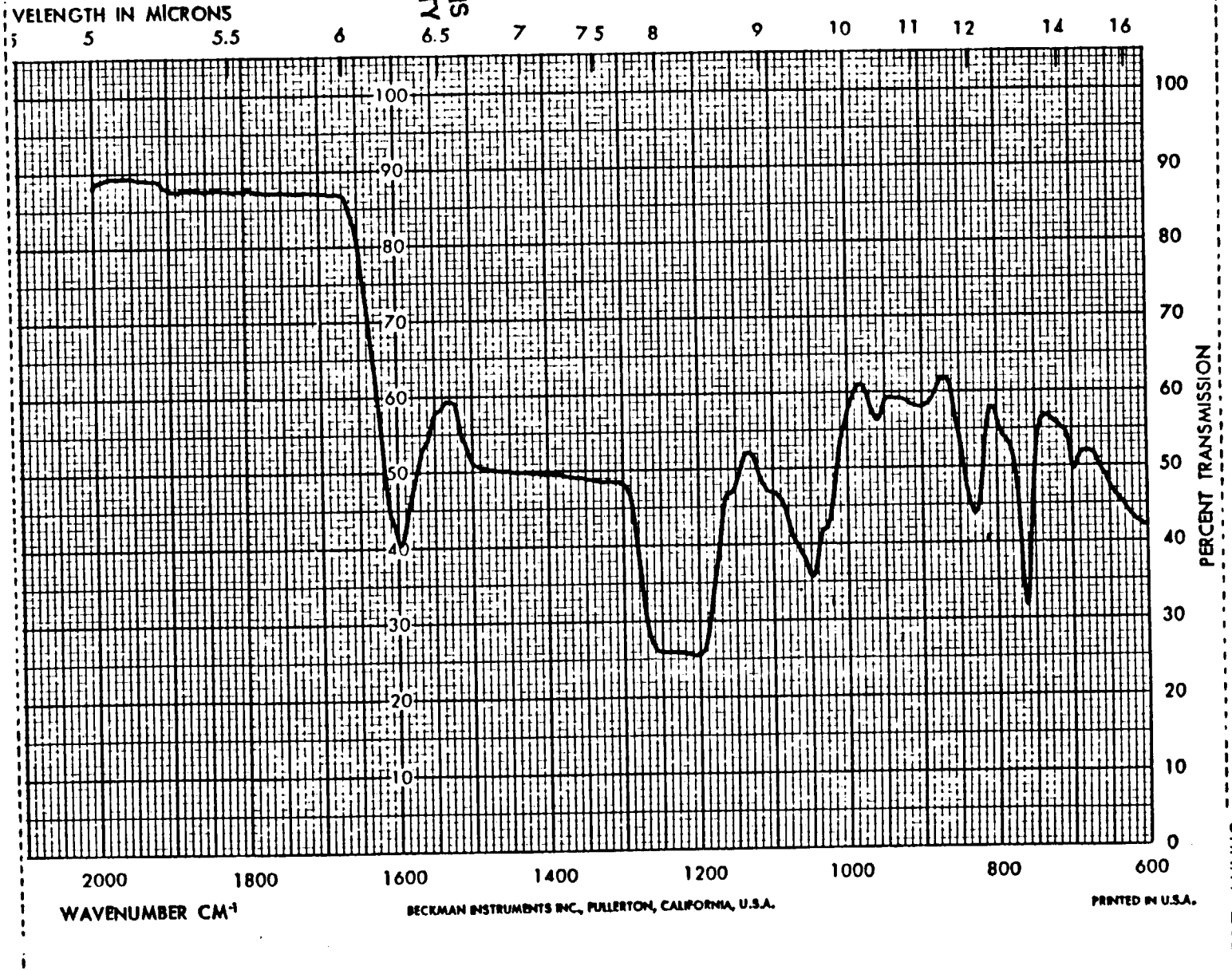


CHART 10D

ORIGINAL PAGE IS
OF POOR QUALITY

SPECTRUM NO. 15193
DATE 7-03-86
SAMPLE FM 5064 J
D09280 # 5T-3

SOURCE

STRUCTURE

PATH 0.2 mm NACL
SOLVENT ACETONE
CONCENTRATION 30-50%
PHASE S
COMMENTS PRE-PREG
MATERIAL

ANALYST Y. MIRANDA

Beckman®
INFRARED
SPECTROPHOTOMETER

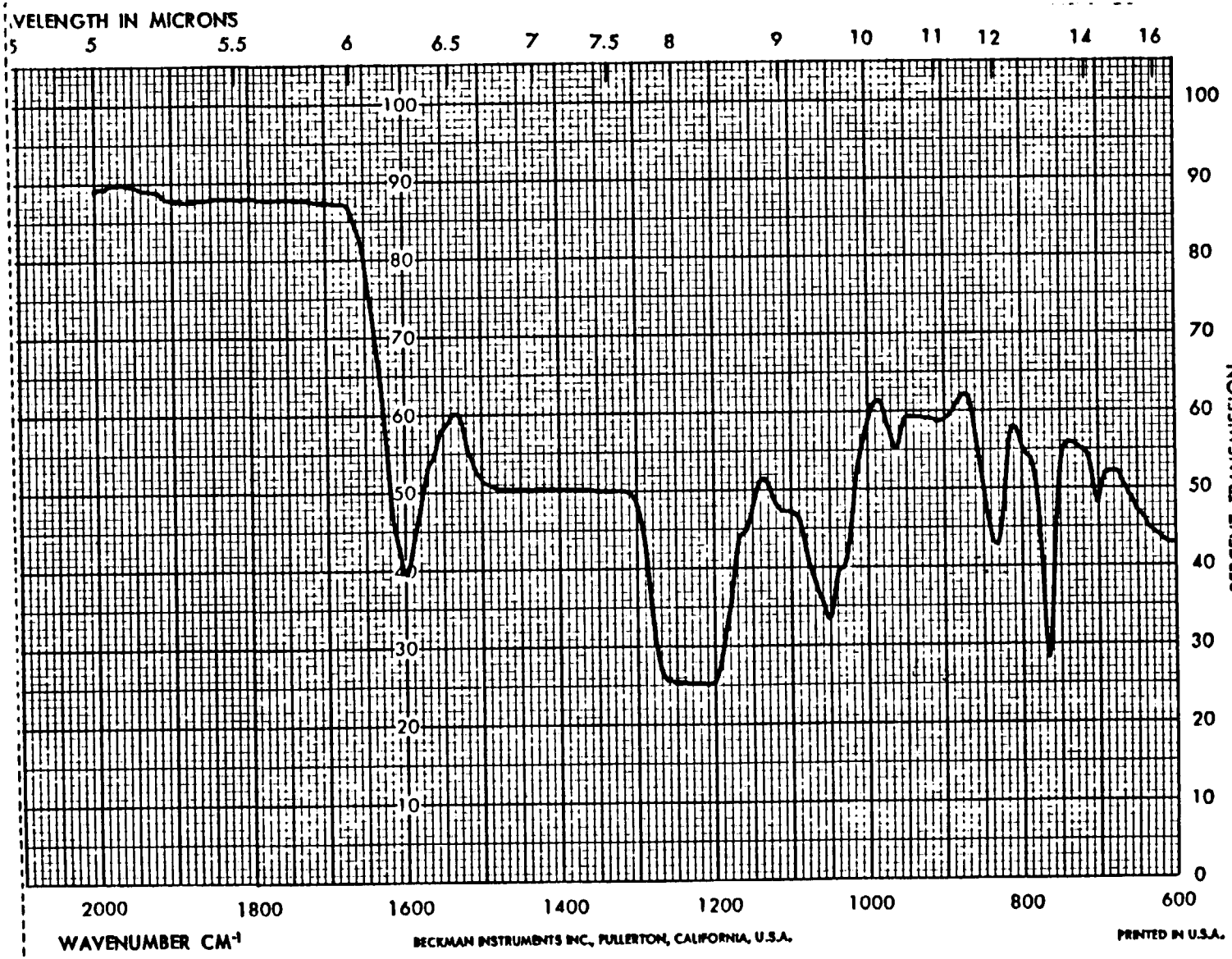


CHART 10E

SPECTRUM NO. 15194
DATE 7-03-86
SAMPLE FM 5064-1
D09280 #E-3

SOURCE

STRUCTURE

PATH 0.3 mm NACL
SOLVENT ACETONE
CONCENTRATION 30-50%T
PHASE 3
COMMENTS PRE-PREG
MATERIAL

ANALYST V. MIRANDA

Beckman®

INFRARED
SPECTROPHOTOMETER

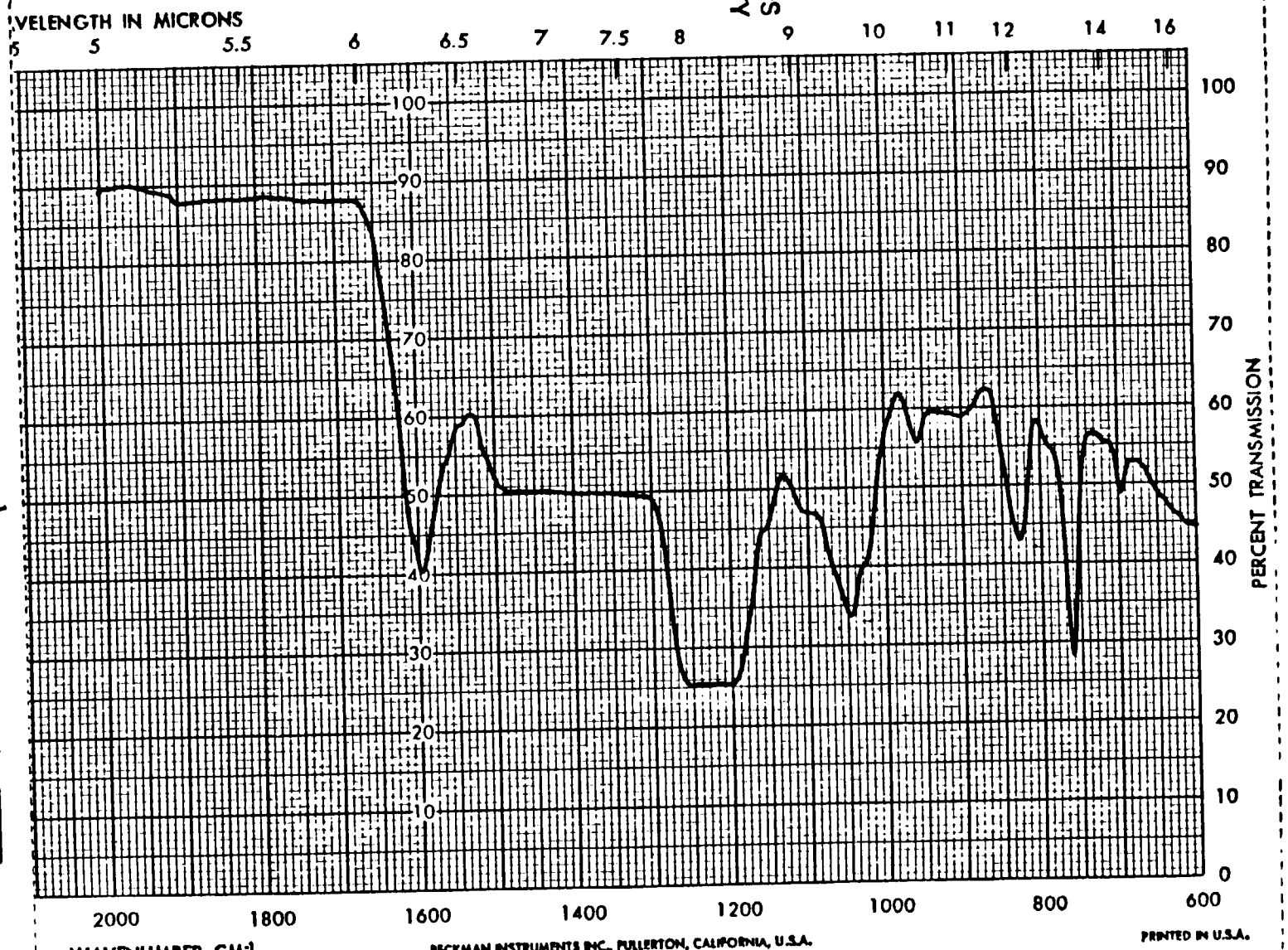


CHART 10F

Chart 21A1

PART NO. 990088

RUN NO ___ DATE 4/11/96
OPERATOR TD
SAMPLE
Dow 680-1-Sheet (1)
ATM Air @ 50cc
FLOW RATE 25cc/s

T-AXIS
SCALE, °C/in 20 20
PROG RATE, °C/min 10
HEAT ✓ COOL ___ ISO ___
SHIFT, in 0

DTA-DSC
SCALE, °C/in ___
(mcal/sec)/in ___
WEIGHT, mg ___
REFERENCE ___

TGA
SCALE, mg/in ___
SUPPRESSION, mg ___
WEIGHT, mg ___
TIME CONST., sec ___
dY/dT (mg/min)/in ___

TMA (air/air)
SCALE, mils/in 0.1/0.1
MODE Expansion
SAMPLE SIZE 0.241
LOAD, g 10
dY/dT (10X), (mils/min)/in ___

MEASURED VARIABLE

DUPONT instruments

ORIGINAL PAGE IS
OF POOR QUALITY

Chart 21A2

PART NO. 990088

RUN NO.___ DATE 11/4/88

OPERATOR TJ

SAMPLE

Dosage - Strength 2

ATM. Air @ 5cfh

FLOW RATE 1-5 SCFM

Argon

T-AXIS

SCALE, °C/in 50 20

PROG RATE, °C/min 10

HEAT ✓ COOL ___ ISO ___

SHIFT, in 0

DTA-DSC

SCALE, °C/in ___

(mcal/sec)/in ___

WEIGHT, mg ___

REFERENCE ___

TGA

SCALE, mg/in ___

SUPPRESSION, mg ___

WEIGHT, mg ___

TIME CONST, sec ___

dY/dT (mg/min)/in ___

TMA (μm/in)

SCALE, mils/in 0.1/0.2

MODE Expansion

SAMPLE SIZE 0.258

LOAD, g 4

dY/dT (10X) (mils/min)/in ___

MEASURED VARIABLE

DuPont Instruments

Chart 21A3

PART NO. 990068

RUN NO ___ DATE 11/3/90
OPERATOR TM
SAMPLE:
Dos 280 1-part (2)
ATM Air @ STP
FLOW RATE 3-5 scfm
X/L

T-AXIS
SCALE, °C/in 30 20
PROG RATE, °C/min 10
HEAT / COOL ___ ISO ___
SHIFT, in 0

DTA-DSC
SCALE, °C/in ___
(mcal/sec)/in ___
WEIGHT, mg ___
REFERENCE ___

TGA
SCALE, mg/in ___
SUPPRESSION, mg ___
WEIGHT, mg ___
TIME CONST., sec ___
dY, (mg/min)/in ___

TMA (µm/in)
SCALE, mils/in 0.1/0.2
MODE Expansion
SAMPLE SIZE 0.14
LOAD, g 10
dY, (10X), (mils/min)/in ___

MEASURED VARIABLE

DUPONT instruments

PART NO. 990088

RUN NO ___ DATE 11/3/16	T-AXIS	DTA-DSC	TGA	TMA (um/mF)	
OPERATOR TH	SCALE, °C/in 50 20	SCALE, °C/in	SCALE, mg/in	SCALE, mils/in 0.1/0.2	
SAMPLE DOS280-1-37861-(1)	PROG. RATE, °C/min 10	(mcal/sec)/in	SUPPRESSION, mg	MODE Expansion	
ATM Air @ STP	HEAT ___ COOL ___ ISO	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE 0.134	
FLOW RATE 3-5SCFH	SHIFT, in 0	REFERENCE	TIME CONST, sec	LOAD, g 10	
Xply			dY, (mg/min) /in	dY, (10X), (mils/min) /in	

$\frac{dL}{L_i \cdot dT} = \frac{26.6004}{0.134} = 8.957$

MEASURED VARIABLE

DUPONT Instruments

ORIGINAL PAGE IS
OF POOR QUALITY

Chart 21A4

Chart 21B1

PART NO. 990088

RUN NO ___ DATE 4/1/92
OPERATOR TJL
SAMPLE:
D 61230-1-RD-(1)
ATM Air @ 1ATP
FLOW RATE 2-SCFM

T-AXIS
SCALE, °C/in 50 20
PROG RATE, °C/min 10
HEAT ✓ COOL ___ ISO ___
SHIFT, in 0

DTA-DSC
SCALE, °C/in ___
(mcal/sec)/in ___
WEIGHT, mg ___
REFERENCE ___

TGA
SCALE, mg/in ___
SUPPRESSION, mg ___
WEIGHT, mg ___
TIME CONST., sec ___
dY/dT (mg/min)/in ___

TMA (µm/min)
SCALE, mils/in 0.1/0.2
MODE Expansion
SAMPLE SIZE 6.251
LOAD, g 10
dY/dT (10X) (mils/min)/in ___

Upper Endotherm (Exo Down)
Tg = 210°C (Extrapolated)
Tg = 197°C (Inflection)

12

MEASURED VARIABLE

DUPONT Instruments

Chart 21B2

PART NO. 990088

RUN NO ____ DATE 11/16

OPERATOR RH

SAMPLE:

DoD 9310 - F20 - (2)

ATM Air @ 200

FLOW RATE 3-5SCFM

Upfly

T-AXIS

SCALE, °C/in 100 20

PROG RATE, °C/min 10

HEAT ✓ COOL ___ ISO ___

SHIFT, in ___ 0 ___

DTA-DSC

SCALE, °C/in ___

(mcal/sec)/in ___

WEIGHT, mg ___

REFERENCE ___

TGA

SCALE, mg/in ___

SUPPRESSION, mg ___

WEIGHT, mg ___

TIME CONST., sec ___

dY/dT (mg/min) /in ___

TMA (μm/min)

SCALE, mils/in 0.1/0.2

MODE Expansion

SAMPLE SIZE 0.202

LOAD, g 10

dY/dT (10X) (mils/min)/in ___

MEASURED VARIABLE ———

DUPONT instruments

ORIGINAL PAGE IS
OF POOR QUALITY

Chart 21B3

PART NO. 990088

RUN NO ___ DATE 11/4/94
OPERATOR CH
SAMPLE
D6526-1-6m-(3)
ATM Air @ STP
FLOW RATE 3 scfm

T-AXIS
SCALE, °C/in 50 to 20
PROG. RATE, °C/min 10
HEAT ✓ COOL ___ ISO ___
SHIFT, in 0

DTA-DSC
SCALE, °C/in ___
(mcal/sec)/in ___
WEIGHT, mg ___
REFERENCE ___

TGA
SCALE, mg/in ___
SUPPRESSION, mg ___
WEIGHT, mg ___
TIME CONST., sec ___
dY/dT (mg/min)/in ___

TMA
SCALE, mils/in 2.0/0.2
MODE Expansion
SAMPLE SIZE 0.139
LOAD, g 2
dY/dT (10X), (mils/min)/in ___

Tg = 126°C (onset)
Tg = 132°C (mid-point)
Tg = 137°C (end-point)

DUPONT Instruments

MEASURED VARIABLE

ORIGINAL PAGE IS
OF POOR QUALITY

PART NO. 990088

RUN NO ___ DATE 11/4/94	T-AXIS	DTA-DSC	TGA	TMA (cm/in F)	
OPERATOR DH	SCALE, °C/in 50 20	SCALE, °C/in	SCALE, mg/in	SCALE, mils/in 0.1/0.2	
SAMPLE: D9280-1EM0-(1)	PROG. RATE, °C/min 20	(mcal/sec)/in	SUPPRESSION, mg	MODE Expansion	
ATM Air @ 30°	HEAT ✓ COOL ___ ISO ___	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE 0.190	
FLOW RATE 75cfh	SHIFT, in 0	REFERENCE	TIME CONST, sec	LOAD, g 20	
Poly			dY, (mg/min) /in	dY, (10X), (mils/min)/in	

$\frac{dC}{dt} = \frac{2(0.0005)}{\frac{0.190}{19.6}} = 1.03$

MEASURED VARIABLE

DUPONT Instruments

ORIGINAL PAGE IS
OF POOR QUALITY

Chart 21B4

Chart 21C1

PART NO. 990088

RUN NO ___ DATE 11/1/86
OPERATOR TH
SAMPLE
Dolfo-2-sym-(1)
ATM Air @ 122°
FLOW RATE 2-5scfh
w/o/y

T-AXIS
SCALE, °C/in 50 / 20
PROG. RATE, °C/min 10
HEAT ✓ COOL ___ ISO ___
SHIFT, in 0

DTA-DSC
SCALE, °C/in ___
(mcal/sec)/in ___
WEIGHT, mg ___
REFERENCE ___

TGA
SCALE, mg/in ___
SUPPRESSION, mg ___
WEIGHT, mg ___
TIME CONST., sec ___
dY/dT (mg/min)/in ___

TMA (μm/inf)
SCALE, mils/in 0.1/0.2
MODE Extension
SAMPLE SIZE 0.258
LOAD, g 10
dY/dT (10X) (mils/min)/in ___

MEASURED VARIABLE

DUPONT instruments

Chart 21C2

PART NO. 990088

RUN NO. ___ DATE 11/1/96

OPERATOR TJL

SAMPLE

D012 PO-2-3 mon. (2)

ATM Air @ STP

FLOW RATE 3-5 SCFH

T-AXIS

SCALE, °C/in 10 or 20

PROG RATE, °C/min 20

HEAT ___ COOL ___ ISO ___

SHIFT, in 0

DTA-DSC

SCALE, °C/in ___

(mcal/sec)/in ___

WEIGHT, mg ___

REFERENCE ___

TGA

SCALE, mg/in ___

SUPPRESSION, mg ___

WEIGHT, mg ___

TIME CONST., sec ___

dY/(mg/min)/in ___

TMA (mil/in)

SCALE, mils/in 0.1/0.2

MODE Expansion

SAMPLE SIZE 0.25"

LOAD, g 10

dY/(10X)/(mils/min)/in ___

MEASURED VARIABLE

DUPONT Instruments

ORIGINAL PAGE IS
OF POOR QUALITY

PART NO. 990088

RUN NO. ___ DATE 11/3/16	T-AXIS	DTA-DSC	TGA	TMA (um/in F)	
OPERATOR DJ	SCALE, °C/in 50 20	SCALE, °C/in	SCALE, mg/in	SCALE, mils/in 0.1/0.2	
SAMPLE: DO9210 - 2- smear - (3)	PROG. RATE, °C/min 10	(mcal/sec)/in	SUPPRESSION, mg	MODE EXPANSION	
ATM Air @ STP	HEAT ✓ COOL ___ ISO ___	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE 0.131	
FLOW RATE 3-5 SCCM	SHIFT, in 0	REFERENCE	TIME CONST., sec	LOAD, g 10	
			dY, (mg/min) /in	dY, (10X), (mils/min) /in	

XP/4

$\frac{\text{Wt}}{\text{Dp}} = \frac{3.6 \text{ (comp)}}{0.131} = 16.62$

DUPONT Instruments

MEASURED VARIABLE

OF POOR QUALITY

Chart 21C3

Chart 21C4

PART NO. 990088

RUN NO ____ DATE 11/1/96
OPERATOR DJ
SAMPLE
Dow 2-1-Smart - (4)
ATM Air @ STP
FLOW RATE 3.5 x 4 N2

T-AXIS
SCALE, °C/in 50 20
PROG RATE, °C/min 10
HEAT ✓ COOL ___ ISO ___
SHIFT, in 0

DTA-DSC
SCALE, °C/in ___
(mcal/sec)/in ___
WEIGHT, mg ___
REFERENCE ___

TGA
SCALE, mg/in ___
SUPPRESSION, mg ___
WEIGHT, mg ___
TIME CONST., sec ___
dY/dT (mg/min)/in ___

TMA (mil/inch)
SCALE, mils/in 0.1/0.2
MODE Expansion
SAMPLE SIZE 0.138"
LOAD, g 10
dY/dT (10X) (mils/min)/in

2nd heat 10°C/min N2 flow

MEASURED VARIABLE

DUPONT instruments

ORIGINAL PAGE IS
OF POOR QUALITY

Chart 21D1

PART NO. 990068

RUN NO. ___ DATE 11/7/86
OPERATOR TDJ
SAMPLE
D012 86-2-FWD (1)
ATM Air @ 100
FLOW RATE Purge

T-AXIS
SCALE, °C/in 30
PROG. RATE, °C/min 10
HEAT ✓ COOL ___ ISO ___
SHIFT, in 0

DTA-DSC
SCALE, °C/in ___
(mcal/sec)/in ___
WEIGHT, mg ___
REFERENCE ___

TGA
SCALE, mg/in ___
SUPPRESSION, mg ___
WEIGHT, mg ___
TIME CONST., sec ___
dY/dT, (mg/min)/in ___

TMA (mm/min)
SCALE, mils/in 0.1/0.2
MODE Expansion
SAMPLE SIZE 0.454
LOAD, g 10
dY/dT, (10X) (mils/min)/in ___

1st Cycle
2nd Cycle
3rd Cycle

MEASURED VARIABLE

DU PONT instruments

ORIGINAL PAGE IS
OF POOR QUALITY

Chart 21D2

PART NO. 990088

RUN NO ___ DATE 11/7/86
OPERATOR DL
SAMPLE
D69200-2-FWD-(2)
ATM Air @ 350
FLOW RATE 2-SCFM

T-AXIS
SCALE, °C/in 50 20
PROG. RATE, °C/min 10
HEAT ✓ COOL ___ ISO ___
SHIFT, in 0

DTA-DSC
SCALE, °C/in ___
(mcal/sec)/in ___
WEIGHT, mg ___
REFERENCE ___

TGA
SCALE, mg/in ___
SUPPRESSION, mg ___
WEIGHT, mg ___
TIME CONST., sec ___
dY/dT (mg/min)/in ___

TMA (mil/in)
SCALE, mils/in 0.1/0.2
MODE Expansion
SAMPLE SIZE 0.165
LOAD, g 0
dY/dT (10X), (mils/min)/in ___

MEASURED VARIABLE

DUPONT instruments

ORIGINAL PAGE IS
OF POOR QUALITY

Chart 21D3

PART NO. 990088

RUN NO. ___ DATE 11/1/94

OPERATOR PL

SAMPLE

Dosage 1 (3)

ATM. Air @ 100

FLOW RATE 2-Client

Poly

T-AXIS

SCALE. °C/in. 50 20

PROG. RATE. °C/min. 10

HEAT ✓ COOL ___ ISO ___

SHIFT. in ___ 0 ___

DTA-DSC

SCALE. °C/in. ___

(mcal/sec)/in. ___

WEIGHT. mg ___

REFERENCE ___

TGA

SCALE. mg/in ___

SUPPRESSION. mg ___

WEIGHT. mg ___

TIME CONST. sec ___

dY. (mg/min) /in ___

TMA (μm/in)

SCALE. mils/in 0.1/0.2

MODE Expansion

SAMPLE SIZE 0.138

LOAD. g 10

dY. (10X). (mils/min)/in ___

MEASURED VARIABLE

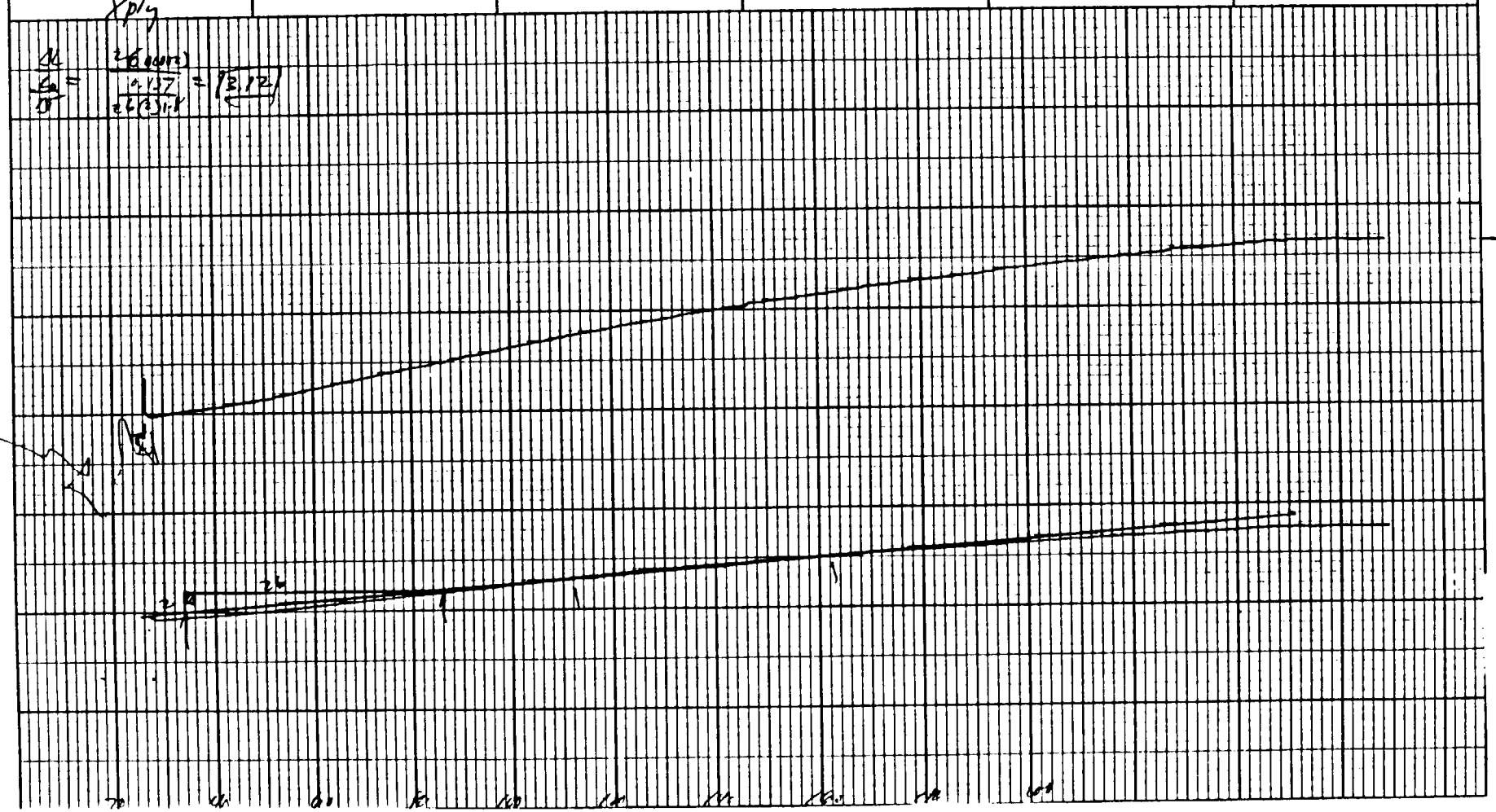
DUPONT instruments

PART NO. 990088

RUN NO ___ DATE 11/7/96	T-AXIS (min/in F)	DTA-DSC	TGA	TMA (min/in F)	
OPERATOR TH	SCALE, °C/in 50-20	SCALE, °C/in	SCALE, mg/in	SCALE, mils/in 0.1/0.2	
SAMPLE: D09280-2-6M) - (4)	PROG. RATE, °C/min 10	(mcal/sec)/in	SUPPRESSION, mg	MODE EXPANSION	
ATM Air @ STP	HEAT ✓ COOL ___ ISO ___	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE 0.137	
FLOW RATE 3-5 SCFM	SHIFT, in 0	REFERENCE	TIME CONST., sec	LOAD, g 10	
			dY, (mg/min) /in	dY, (10X), (mils/min)/in	

Xplg

$\frac{\Delta H}{\Delta T} = \frac{26 \text{ (mils)}}{0.137} = 189.78$



MEASURED VARIABLE

DUPONT Instruments

Chart 21D4

Chart 21E1

PART NO. 990088

RUN NO. ___ DATE 11/10/86
OPERATOR TA
SAMPLE: 10% 2,6-DMBT-(1)
ATM Air @ 325
FLOW RATE Purified

T-AXIS
SCALE, °C/in 50 20
PROG. RATE, °C/min 10
HEAT ✓ COOL ___ ISO ___
SHIFT, in ___ 0

DTA-DSC
SCALE, °C/in ___
(mcal/sec)/in ___
WEIGHT, mg ___
REFERENCE ___

TGA
SCALE, mg/in ___
SUPPRESSION, mg ___
WEIGHT, mg ___
TIME CONST., sec ___
dY/dt (mg/min) /in ___

TMA (mm/air)
SCALE, mils/in 0.1/0.0
MODE Expansion
SAMPLE SIZE 0.151
LOAD, g 10
dY/dt (10X) (mils/min)/in ___

MEASURED VARIABLE

DUPONT instruments

ORIGINAL PAGE IS
OF POOR QUALITY

Chart 21E2

PART NO. 990088

RUN NO. ___ DATE 4/4/96
OPERATOR TH
SAMPLE
Dexter-Hysol (1)
ATM Air @ STP
FLOW RATE 3-50CFM
Wply

T-AXIS
SCALE, °C/in 30 20
PROG. RATE, °C/min 10
HEAT ✓ COOL ___ ISO ___
SHIFT, in 0

DTA-DSC
SCALE, °C/in ___
(mcal/sec)/in ___
WEIGHT, mg ___
REFERENCE ___

TGA
SCALE, mg/in ___
SUPPRESSION, mg ___
WEIGHT, mg ___
TIME CONST., sec ___
dY/dT (mg/min)/in ___

TMA (mils/min)
SCALE, mils/in 0.1/0.2
MODE Expansion
SAMPLE SIZE 0.25"
LOAD, g 10
dY/dT (10X) (mils/min)/in ___

DUPONT Instruments

MEASURED VARIABLE

Chart 21E3

PART NO. 990088

RUN NO ___ DATE 11/1/90
OPERATOR TDI
SAMPLE: D6220-3-inner-(3)
ATM Air @ RT
FLOW RATE 2-SCFH
Xpl'g

T-AXIS
SCALE, °C/in 50 20
PROG. RATE, °C/min 10
HEAT ✓ COOL ___ ISO ___
SHIFT, in 0

DTA-DSC
SCALE, °C/in ___
(mcal/sec)/in ___
WEIGHT, mg ___
REFERENCE ___

TGA
SCALE, mg/in ___
SUPPRESSION, mg ___
WEIGHT, mg ___
TIME CONST., sec ___
dY/dT (mg/min)/in ___

TMA (mm/hr)
SCALE, mils/in 0.1/0.2
MODE Expansion
SAMPLE SIZE 0.140
LOAD, g 10
dY/dT (10X) (mils/min)/in ___

3 (6 mils) = 13.057
3 (6 mils) = 13.057

DUPONT Instruments

MEASURED VARIABLE

Chart 21E4

PART NO. 990088

RUN NO. ___ DATE 8/7/91

OPERATOR DJ

SAMPLE D0121° - 3 - smart (4)

ATM Air @ STP

FLOW RATE 3-SCCM

T-AXIS

SCALE, °C/in 50 20

PROG. RATE, °C/min 10

HEAT ✓ COOL ___ ISO ___

SHIFT, In 0

DTA:DSC

SCALE, °C/in ___

(mcal/sec)/in ___

WEIGHT, mg ___

REFERENCE ___

TGA

SCALE, mg/in ___

SUPPRESSION, mg ___

WEIGHT, mg ___

TIME CONST., sec ___

dY, (mg/min) /in ___

TMA (um/min)

SCALE, mils/in 0.1/0.1

MODE Expansion

SAMPLE SIZE 0.1"

LOAD, g 10

dY, (10X), (mils/min)/in ___

MEASURED VARIABLE

DUPONT Instruments

Chart 21F1

PART NO. 990088

RUN NO ____ DATE 11/12/96
OPERATOR DH
SAMPLE
D6520-3-F40-(1)
ATM Air @ 35cc
FLOW RATE 35cc

T-AXIS
SCALE, °C/in 50 20
PROG RATE, °C/min 10
HEAT ✓ COOL ___ ISO ___
SHIFT, In 0

DTA-DSC
SCALE, °C/in ___
(mcal/sec)/in ___
WEIGHT, mg ___
REFERENCE ___

TGA
SCALE, mg/in ___
SUPPRESSION, mg ___
WEIGHT, mg ___
TIME CONST, sec ___
dY, (mg/min) /in ___

TMA Lucite (Mar)
SCALE, mils/in 0.1/0.2
MODE Extension
SAMPLE SIZE 0.25
LOAD, g 10
dY, (10X), (mils/min) /in ___

MEASURED VARIABLE

DUPONT Instruments

Chart 21F2

PART NO. 990088

RUN NO ___ DATE 11/2/90

OPERATOR (1)

SAMPLE

D09380 - 3-6MD - (2)

ATM Air @ 5.52

FLOW RATE 2-55CFH

11/2/90

T-AXIS

SCALE, °C/in 50 20

PROG. RATE, °C/min 10

HEAT ___ °COOL ___ ISO ___

SHIFT, in 0

DTA-DSC

SCALE, °C/in ___

(mcal/sec)/in ___

WEIGHT, mg ___

REFERENCE ___

TGA

SCALE, mg/in ___

SUPPRESSION, mg ___

WEIGHT, mg ___

TIME CONST., sec ___

dY/dT (mg/min)/in ___

TMA (μin/in)

SCALE, mils/in 0.1/div

MODE EXPANSION

SAMPLE SIZE 0.256

LOAD, g ___

dY/dT (10X) (mils/min)/in ___

MEASURED VARIABLE

DUPONT instruments

Chart 21F3

PART NO. 990088

RUN NO ___ DATE 11/7/14

OPERATOR [illegible]

SAMPLE

D01210-3-EM)-(3)

ATM Air @ 30

FLOW RATE 3-5SCFH

XRD

T-AXIS

SCALE, °C/in 50 20

PROG RATE, °C/min 10

HEAT ✓ COOL ___ ISO ___

SHIFT, in 0

DTA-DSC

SCALE, °C/in ___

(mcal/sec)/in ___

WEIGHT, mg ___

REFERENCE ___

TGA

SCALE, mg/in ___

SUPPRESSION, mg ___

WEIGHT, mg ___

TIME CONST., sec ___

dY/dT, (mg/min)/in ___

TMA (mm/hr)

SCALE, mils/in 0.1/0.2

MODE Expansion

SAMPLE SIZE 0.128

LOAD, g 4

dY/dT (10X), (mils/min)/in ___

MEASURED VARIABLE

DuPont Instruments

Chart 21F4

PART NO. 990088

RUN NO ____ DATE 11/7/96

OPERATOR DJ

SAMPLE Dow 90-3-6MD (1)

ATM Air @ 30

FLOW RATE 3 SCCM

Xplg

T-AXIS

SCALE, °C/in 50 / 20

PROG RATE, °C/min 10

HEAT 200 COOL 150

SHIFT, in 0

DTA-DSC

SCALE, °C/in ____

(mcal/sec)/in ____

WEIGHT, mg ____

REFERENCE ____

TGA

SCALE, mg/in ____

SUPPRESSION, mg ____

WEIGHT, mg ____

TIME CONST., sec ____

dY/dT, (mg/min)/in ____

TMA (μin/min)

SCALE, mils/in 0.1/0.2

MODE Expansion

SAMPLE SIZE 0.132

LOAD, g 10

dY/dT (10X), (mils/min)/in ____

MEASURED VARIABLE

DUPONT instruments

TABLE OF CONTENTS

FILLER TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

Filler Lot for NASA Lot# 3

CHARTS

U.S. Polymeric

FILLER TESTING

NAS8-36298

U.S. POLYMERIC O.E. 71108

Filler Lot for NASA Lot# 3

1. Carbon Content, %
QAI-5560

SAMPLE	#3A-1	#3A-2	#3A-3
	99.40	99.32	99.44
NASA LOT# 3 AVERAGE			99.39

2. Ash Content, %
PTM-71B

	0.000	0.000	0.000
	0.000	0.000	0.005
AVG.	0.000	0.000	0.002
NASA LOT# 3 AVERAGE			0.001

3. Atomic Absorption, ppm
CTM-53B
(Values are average of 2 determinations)

	#3A-1	#3A-2	#3A-3	LOT#3 AVG.
Na	6.0	6.0	6.0	6.0
K	2.5	1.0	2.0	1.8
Ca	2.5	2.5	2.0	2.3
Mg	0.0	0.0	0.0	0.0
Li	0.0	0.0	0.0	0.0
TOTAL	11.0	9.5	10.0	10.2

3a. Moisture Content, %
CTM-53B

	.010	.015	0.000
	.005	.020	0.000
AVG.	.008	.018	0.000
NASA LOT# 3 AVERAGE			.008

3b. Ash Content, %
CTM-53B

	.025	.000	.000
	.025	.010	.000
AVG.	.025	.005	.000
NASA LOT# 3 AVERAGE			.010

4. pH, Units
ASTM D1512

	4.80	4.75	4.85
	4.95	4.80	4.80
AVG.	4.88	4.78	4.82
NASA LOT# 3 AVERAGE			4.83

5. Particle Size, microns
S.E.M. procedure
(Average values are of 20 determinations)

AVG.	.51	.51	.42
Maximum	.99	.88	.85
Minimum	.20	.18	.15
Std. Dev	.23	.20	.17
NASA LOT# 3 AVERAGE SIZE			.48

6a. TGA, °C at 50% Loss
CTM-51

	864	860	850
NASA LOT# 3 AVERAGE			858

HITCO MATERIALS DIVISION
700 E. DYER ROAD, SANTA ANA, CALIFORNIA 92707 • (714) 549-1101 • TWX (910) 595-1130 • FAX # (714) 549-2858-5-2437

Filler Lot for NASA Lot# 3

6b. TGA
CTM-51

See Charts 6A-6C

7. Particle Size Distribution
CTM-72

See Charts 7A-7C

7a. Particle Size, microns
CTM-72

	#3A-1	#3A-2	#3A-3
	.89	.94	.89
	.94	.83	.86
AVG.	.92	.88	.88

NASA LOT# 3 AVERAGE .89

U.S. Polymeric

Hamid M. Quraishi

Hamid M. Quraishi, Manager
Quality Assurance Department

ORIGINAL PAGE IS
OF POOR QUALITY

CHART 6A

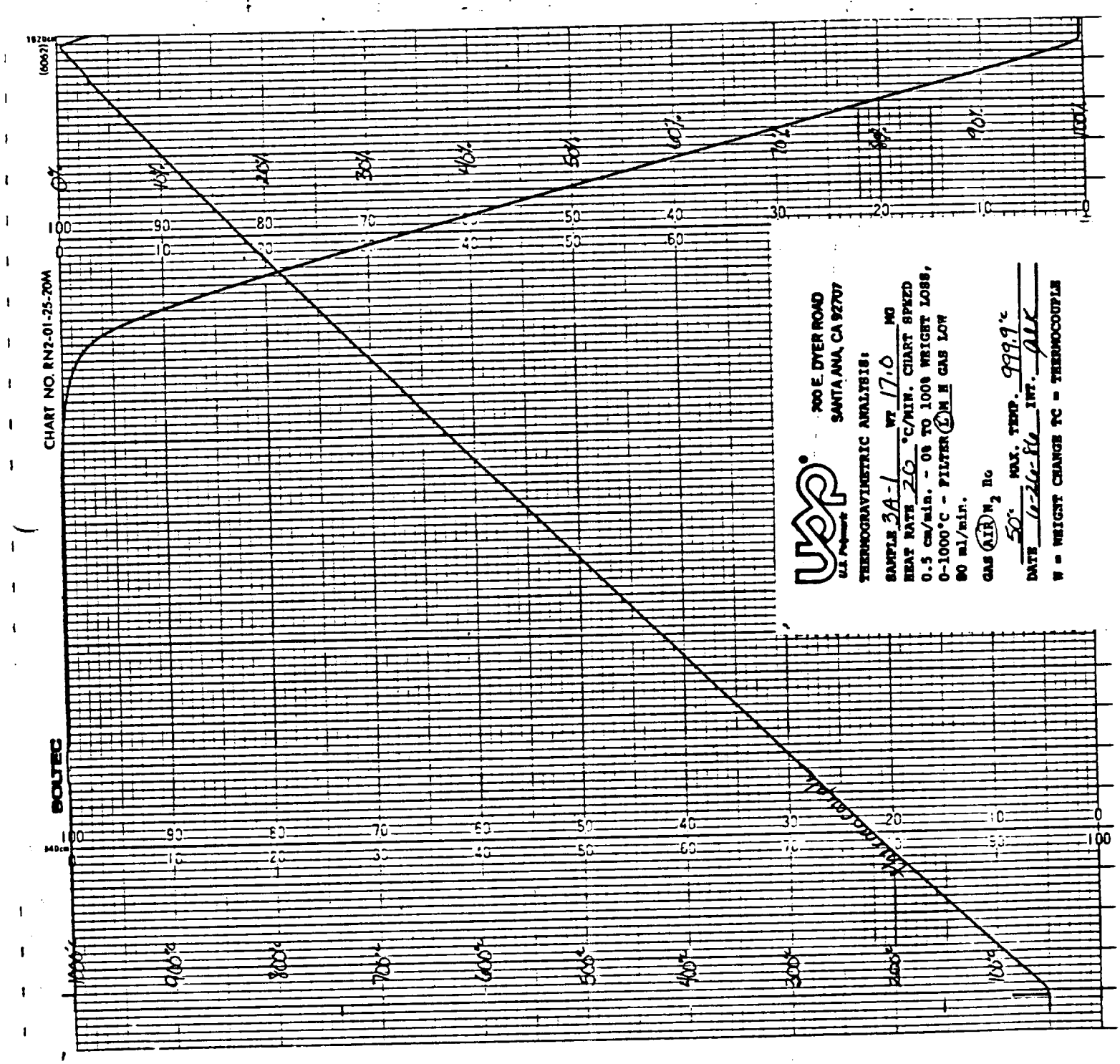


CHART 6B

ORIGINAL PAGE IS
OF POOR QUALITY

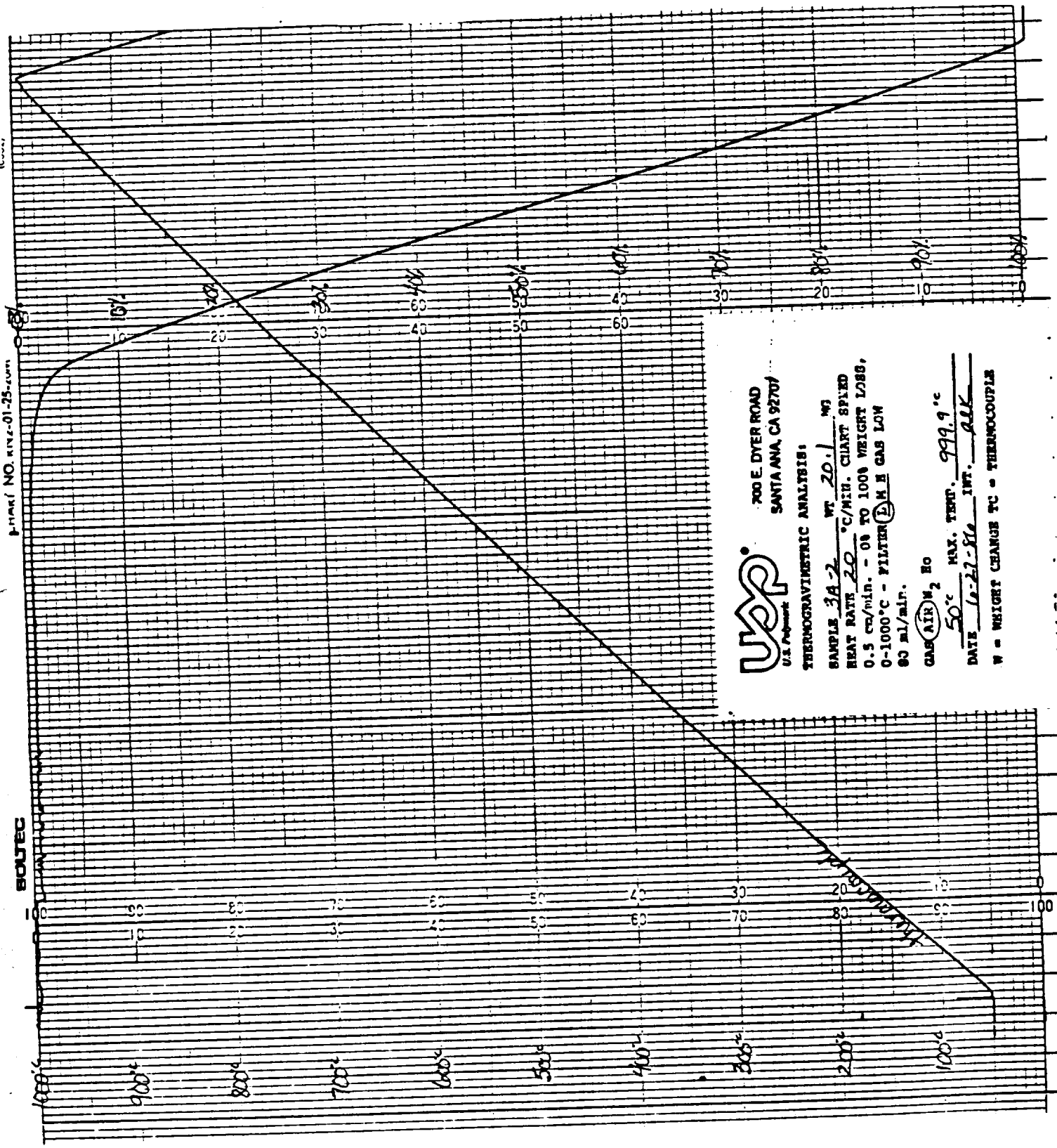
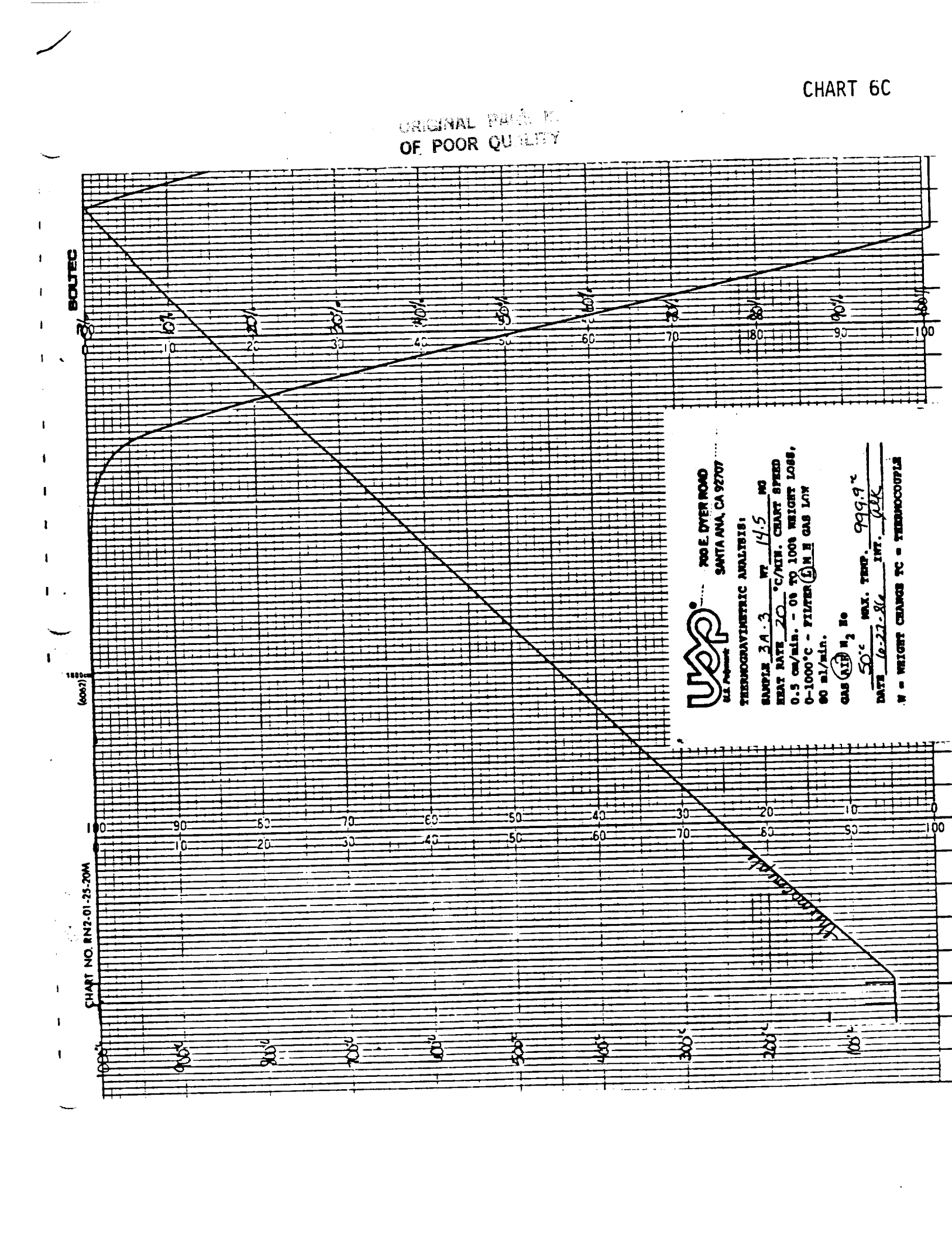


CHART 6C



HORIBA CAPA-500
PARTICLE ANALYZER

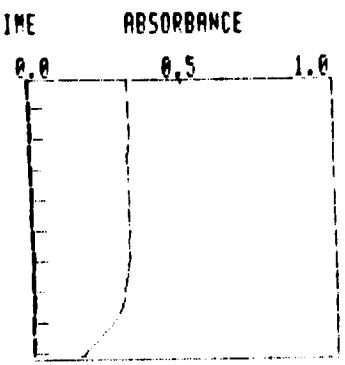
DATE 5-27-86
#1 SAMPLE NASA LOT#3A-1
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (PM)
D(MIN)	0.01(PM)
D(DIV)	0.50(PM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

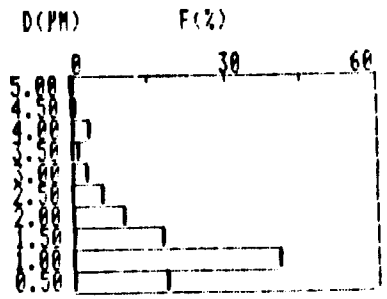


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.5	0.5
4.00-3.50	3.2	3.6
3.50-3.00	1.0	4.7
3.00-2.50	2.5	7.2
2.50-2.00	6.0	13.1
2.00-1.50	10.2	23.3
1.50-1.00	17.5	40.8
1.00-0.50	40.7	81.5
0.50-0.00	18.5	100.0

D(AVE) 0.89 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



LOT#3A-1
Sample#1

HORIBA CAPA-500
PARTICLE ANALYZER

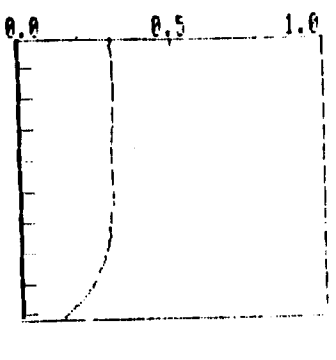
DATE 5-27-86
#2 SAMPLE NASA LOT#3A-1
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (PM)
D(MIN)	0.01(PM)
D(DIV)	0.50(PM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

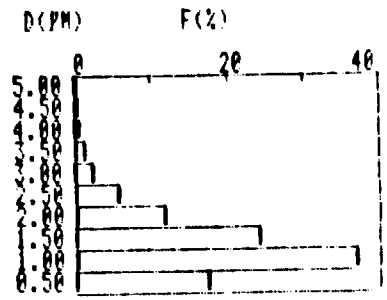


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.0	0.0
4.00-3.50	0.6	0.6
3.50-3.00	1.2	1.8
3.00-2.50	2.3	4.1
2.50-2.00	5.6	9.7
2.00-1.50	11.8	21.5
1.50-1.00	24.2	45.7
1.00-0.50	37.0	82.7
0.50-0.00	17.3	100.0

D(AVE) 0.94 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



LOT 3A-1
Sample#2

ORIGINAL PAGE IS
OF POOR QUALITY

CHART 7A

HORIBA CAPA-500
PARTICLE ANALYZER

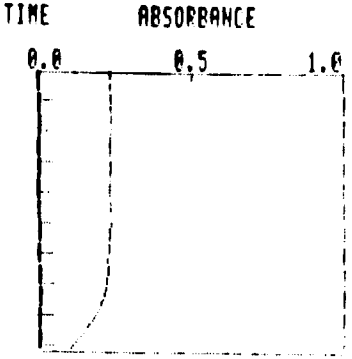
DATE 5-23-86
SAMPLE NASA Lot#3A-2
#1 SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (μM)
D(MIN)	0.01(μM)
D(DIV)	0.50(μM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

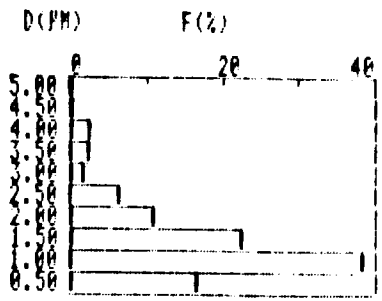


* DISTRIBUTION TABLE (BY VOL.)

D(μM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.0	0.0
4.00-3.50	2.3	2.3
3.50-3.00	2.4	4.7
3.00-2.50	1.5	6.2
2.50-2.00	6.2	12.5
2.00-1.50	10.6	23.1
1.50-1.00	22.3	45.4
1.00-0.50	38.4	83.8
0.50-0.00	16.2	100.0

D(AVE) 0.94 (μM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot#3A2
Sample#1

HORIBA CAPA-500
PARTICLE ANALYZER

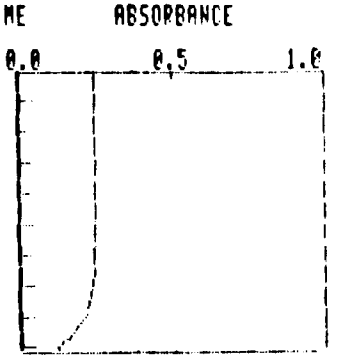
DATE 5-23-86
SAMPLE NASA LOT#3A-2
#2 SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (μM)
D(MIN)	0.01(μM)
D(DIV)	0.50(μM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

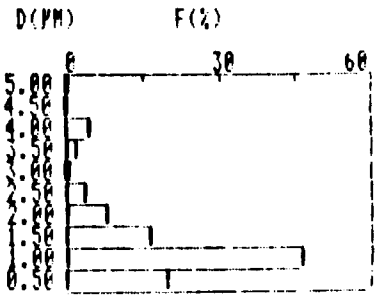


* DISTRIBUTION TABLE (BY VOL.)

D(μM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.0	0.0
4.00-3.50	4.2	4.2
3.50-3.00	1.6	5.9
3.00-2.50	0.6	6.4
2.50-2.00	3.6	10.0
2.00-1.50	7.8	17.8
1.50-1.00	16.3	34.2
1.00-0.50	46.3	80.5
0.50-0.00	19.5	100.0

D(AVE) 0.83 (μM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot#3A-2
Sample#2

CHART 7B

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-23-86

#1 SAMPLE NASA LOT#3A-3
SOLVENT ETHYL GLYCOL
C=0.01 mg/mL

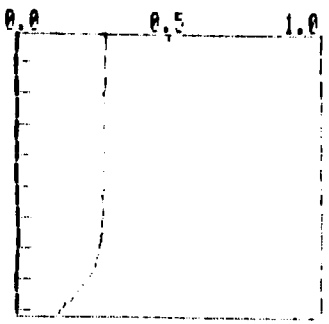
* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (μM)
D(MIN)	0.01(μM)
D(DIV)	0.50(μM)
SPEED	5000. (RPM)

TIME 0 H 11 MIN 31 SEC

DATA

TIME ABSORBANCE

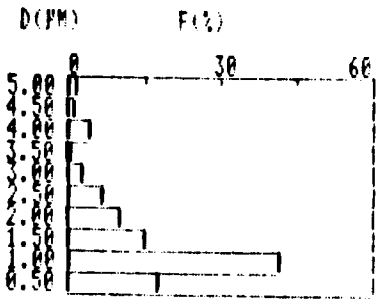


* DISTRIBUTION TABLE (BY VOL.)

D(μM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	1.4	1.4
4.50-4.00	0.9	2.3
4.00-3.50	4.2	6.5
3.50-3.00	0.3	6.9
3.00-2.50	2.5	9.4
2.50-2.00	6.5	15.9
2.00-1.50	10.0	25.9
1.50-1.00	14.8	40.7
1.00-0.50	41.7	82.3
0.50-0.00	17.7	100.0

D(AVE) 0.89 (μM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot# 3A-3
Sample #1

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-23-86

#2 SAMPLE NASA LOT#3A-3
SOLVENT ETHYL GLYCOL
C=0.01 mg/mL

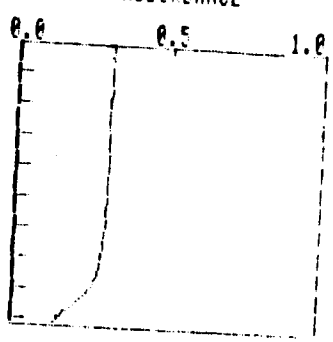
* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (μM)
D(MIN)	0.01(μM)
D(DIV)	0.50(μM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

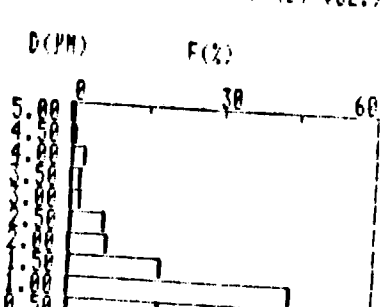


* DISTRIBUTION TABLE (BY VOL.)

D(μM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.5	0.5
4.00-3.50	2.3	2.8
3.50-3.00	1.8	4.5
3.00-2.50	1.8	6.3
2.50-2.00	6.6	12.9
2.00-1.50	7.5	20.3
1.50-1.00	17.8	38.1
1.00-0.50	44.0	82.1
0.50-0.00	17.9	100.0

D(AVE) 0.86 (μM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot #3A-3
Sample #2

CHART 7C

TABLE OF CONTENTS

RESIN TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

USP-39A Resin Lot for NASA Lot# 3

CHARTS

U.S. Polymeric

RESIN TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

USP-39A Resin Lot for NASA Lot# 3

1. Resin Solids, % PTM-7C		#3-1 79.3 78.1 77.2
	AVG.	78.2
2. Specific Gravity @ 25°C PTM-29C		1.181
3. Viscosity, Brookfield, cps. @ 22.8°C PTM-14C		15,000
4. Gel Time, min:sec PTM-47B		4:22
5. Atomic Absorption, ppm CTM-53B (Values are averages of four determinations)	Na	18.0
	K	1.8
	Ca	5.8
	Mg	1.3
	Li	0.0
	TOTAL	26.8
6. Volatiles, Gas Chromatography CTM-55		See Charts 6A
7. TGA, % Weight Loss at 500°C CTM-51 (AIR)		39.9 See Chart 7A
8. DSC, temperature °C CTM-50A		185 See Chart 8A
9. HPLC CTM-49A		See Chart 9A
10. GPC, Average molecular wt. CTM-49A		1932 See Chart 10A
11. pH, units CTM-1B		8.2

HITCO MATERIALS DIVISION
700 E. DYER ROAD, SANTA ANA, CALIFORNIA 92707 • (714) 549-1101 • TWX (910) 595-1130 • FAX # (714) 549-2858-5-2407

USP-39A Resin Lot for NASA Lot# 3

12. Phenol Content, %
CTM-55 Appendix 1

	#3-1
	11.64
	12.02
AVG.	11.83

13. Chang's Index, ml.
CTM-5B

22.2

14. RDS, Minimum Viscosity, cps.
CTM-57A

	Min. Visc.	°C
#3-1	175	111

See Charts 14A

15. NMR
Vendor procedure

See Charts 15A

U. S. Polymeric

Hamid M. Quraishi

Hamid M. Quraishi, Manager
Quality Assurance Department

TYPICAL GAS CHROMATOGRAPH SET-UP

Operator	G.M.B.	Date	12/16/86
Column		Detector	FID
Length	6ft.	Voltage	
Dia.	1/4 in.	Sensit.	
Liquid Phase	AT-1000	Flow Rates, ml/min	
Wt. %	0.1	Hydrogen	60 Air 96
Support	GRAPHPAC	Scavenge	
Mesh	80/100	Split	
Carrier Gas	He.	Temperature, °C	
Rotameter		Det.	220 Inj. 200
Inlet Press	60 psig	Column Initial	60
Rate	30 ml/min	Final	210
CHART SPEED		Rate	5°C/MIN
SAMPLE	USP39A, 3-1	Solvent	THF
Size	0.05 ul	Concn.	0.0892 g/ml

GAS CHROMATOGRAPHY STANDARD SOLVENT

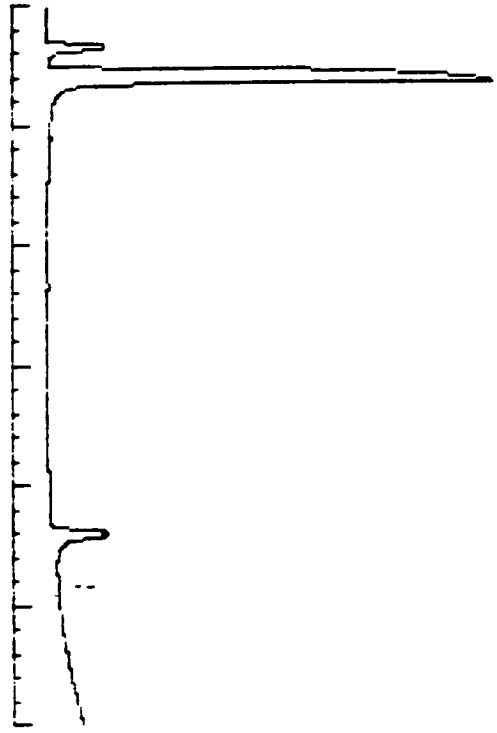
TEST METHOD CTM-55

STANDARD SOLVENT/MONOMER	RETENTION TIME (MINS.)
MEOH	.6
ETHANOL	1.18
MECL2	1.28
ACETONE	1.45
IPA	1.83
THF	3.08
ACETONITRILE	3.2
CRESOL	4.03
MEK	4.08
FURFURAL	15.03
TOLUENE	17.98
CHLOROBENZENE	19.6
PHENOL	22.08

NOTE: THF WAS USED TO DILUTE THE RESIN SAMPLES.

ORIGINAL PAGE IS
OF POOR QUALITY

*** REAL TIME CHROMATOGRAM ***



FINAL FULL SCALE MV.=1000.00

SAMPLE: USP39A 3-1
MISC.: C=0.10892 GMS/ML

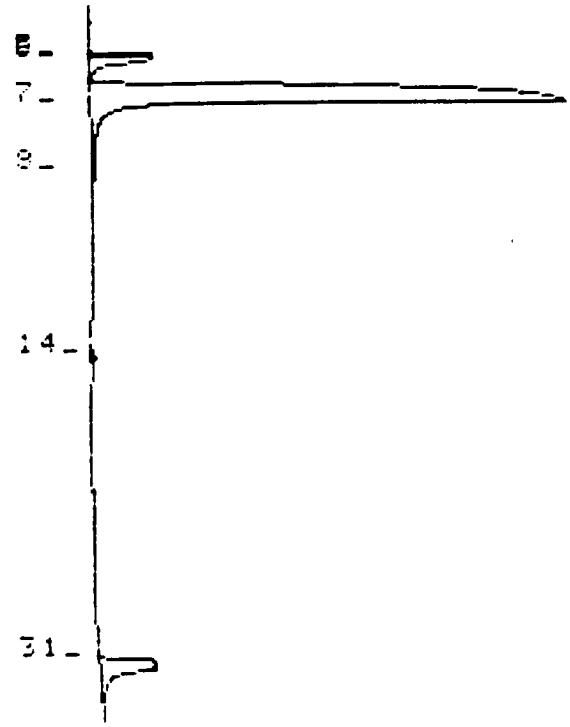
TIME: 15:29
DATE: 12/11/86
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES
DELAY TIME: 0.00
CHAN: 0

PK NO.	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
2	.65	1477	.041	2	220
5	1.70	76001	2.105	2	11151
6	1.80	187200	5.164	2	11148
7	3.30	2984100	82.637	2	85858
8	5.60	8003	.222	3	589
14	11.75	11088	.307	1	635
31	21.97	343230	9.505	2	10407

TOTAL AREA= 3611095
THRESHOLD= 1
MIN.PK.WIDTH= 15
AREA REJECT= 1000

VERTICAL SCALE FACTOR: 1X



SAMPLE: USP39A 3-1
MISC.: C=0.10892 GMS/ML

TIME: 15:29
DATE: 12/11/86
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES
DELAY TIME: 0.00
CHAN: 0

PK NO.	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
5	1.70	76001	2.117	2	11151
6	1.80	187200	5.214	2	11148
7	3.30	2984100	83.110	2	85858
31	21.93	343230	9.559	3	10407

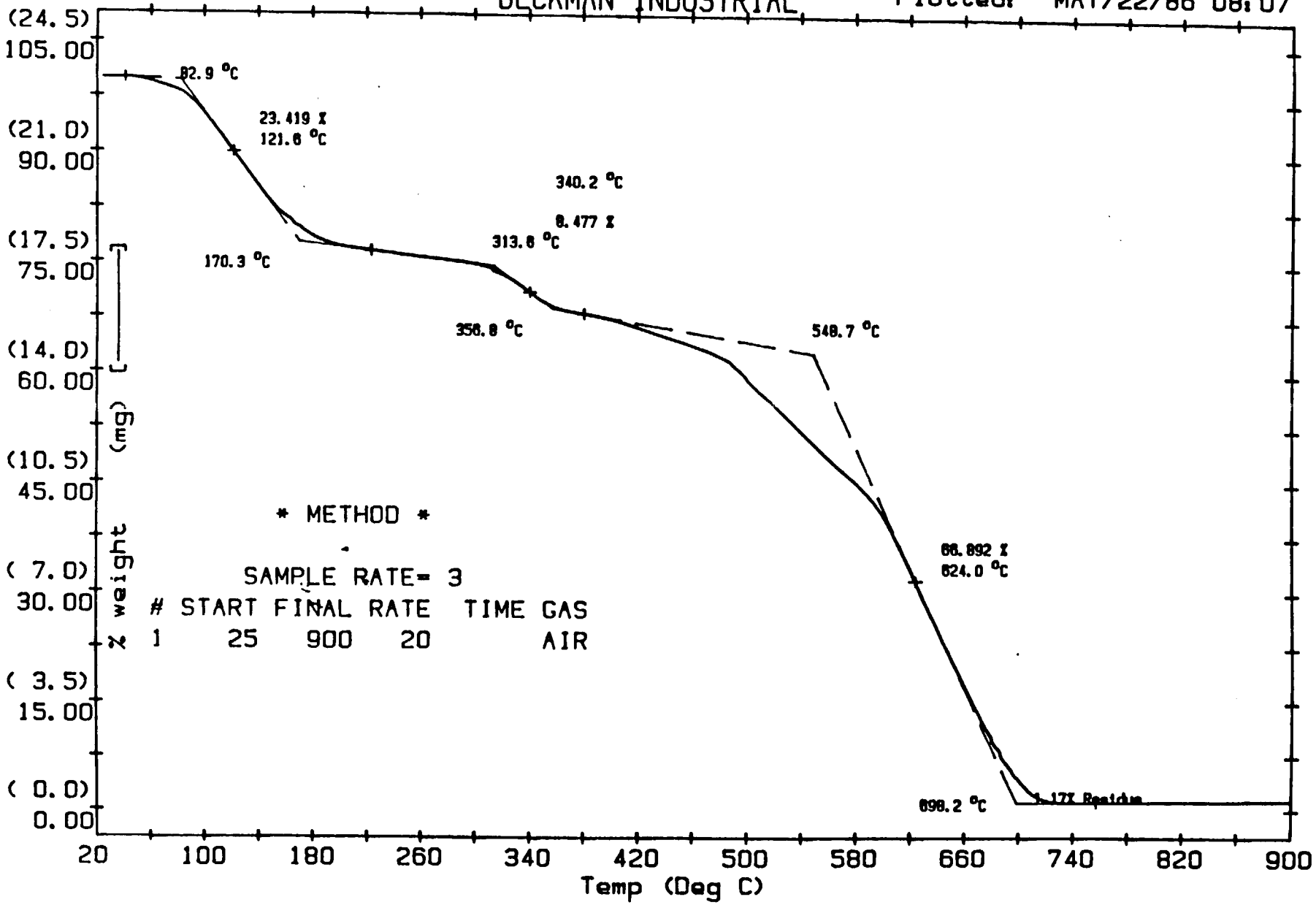
TOTAL AREA= 3590531
THRESHOLD= 1
MIN PK.WIDTH= 15
AREA REJECT= 12000

Sample: USP39A71108 3-1
Size: 23.424 mg
Run No: MIR #13079 (I2)
Date: MAY/21/86 12:58

TGA

OMNITHERM DATA SYSTEM
BECKMAN INDUSTRIAL

Operator: M. WEGENER
Disk ID: DATA DISK #107
File No: D 36.DAT V2.1
Plotted: MAY/22/86 08:07



* METHOD *

SAMPLE RATE= 3

#	START	FINAL	RATE	TIME	GAS
1	25	900	20		AIR

ORIGINAL PAGE IS
OF POOR QUALITY

CHART 7A

Beckman Industrial™ ANALYTICAL LABORATORY SERVICES

PART NO. 990088

CHART 8A

RUN NO. ____ DATE 2-23-87

OPERATOR quick

SAMPLE: 3-1

usp39A

ATM N2 @ 1atm

FLOW RATE 40ml/min

T-AXIS

SCALE, °C/in 50

PROG. RATE, °C/min 20°

HEAT ✓ COOL ____ ISO ____

SHIFT, in 0

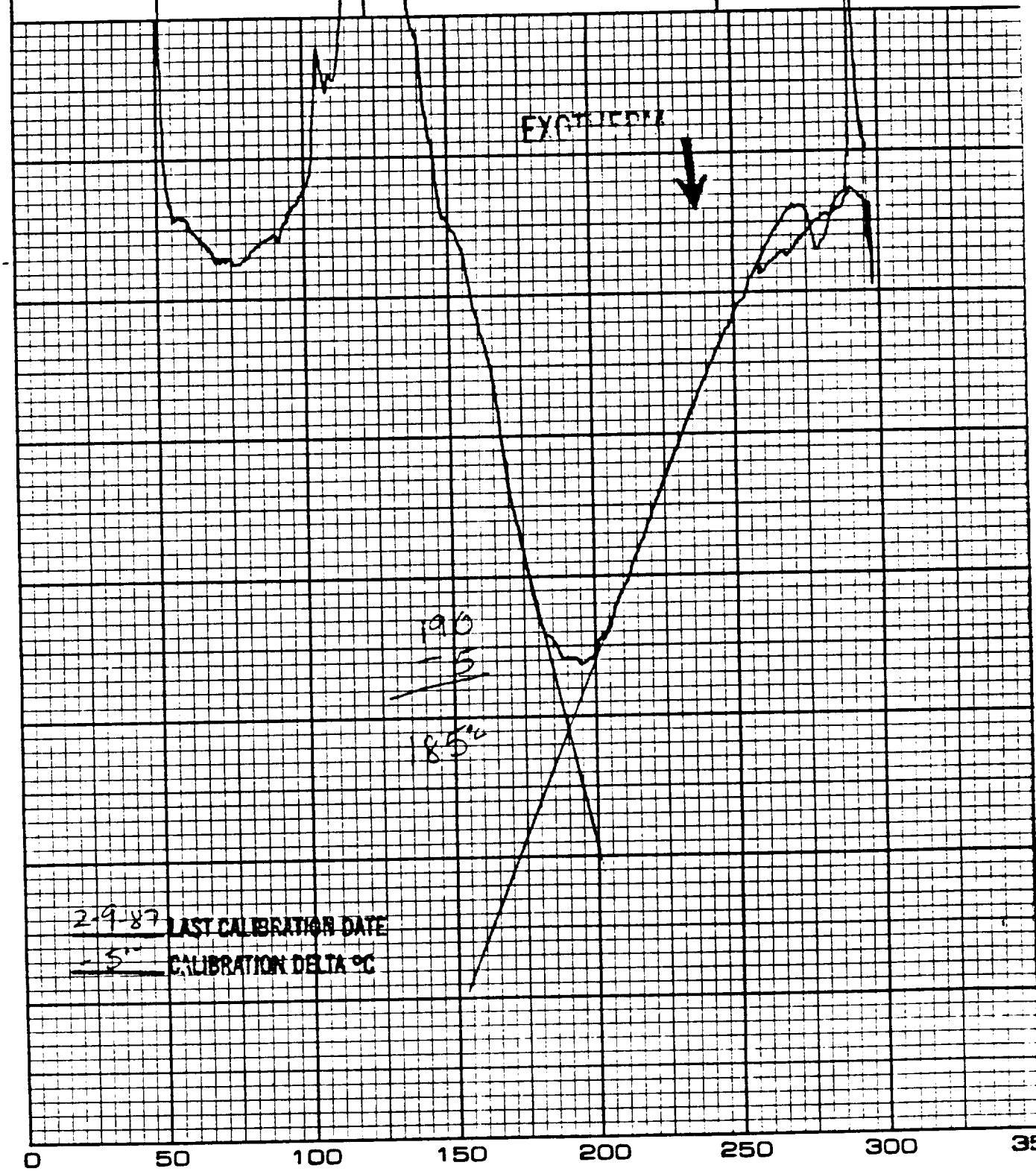
DTA-DSC

SCALE, °C/in 1.0/5x

[mcal/sec]/in ____

WEIGHT, mg 3.8

REFERENCE 1atm seal



2-9-87 LAST CALIBRATION DATE

-5° CALIBRATION DELTA °C

DUPONT Instruments

MEASURED VARIABLE

DATA FILE A:PHEN028.HDR TAKEN 09-05-1986 11:46:23

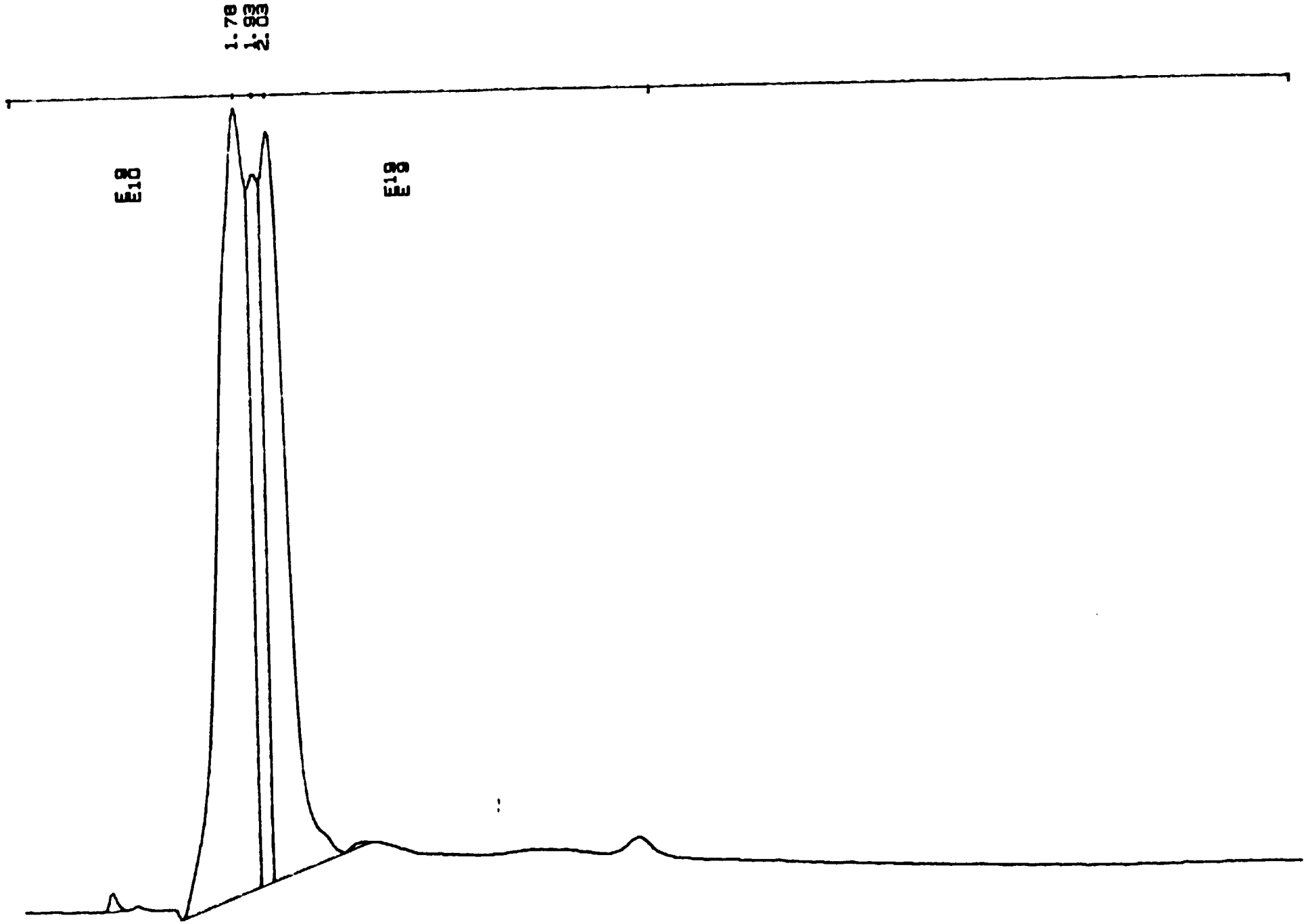
********* AREA PERCENT REPORT *********

```
**********************************************************************
* Sample Name: USP39A,3-1,C=6.93                Operator Initials: JGZ
* Date:  09-05-1986 11:46:23 Method:PHENOLIC    DATA FILE: A:PHEN028.PTS
* Interface: 4                  Cycle#:  28     Channel#: 0    Vial#: N.A.
* Starting Peak Width:  10   Threshold:  .01
**********************************************************************
*  Instrument Type: BECKMAN HPLC          Column Type: MICROBONDAPAK C-18
*             Solvent Description: THF/WATER, 2:1 BY WEIGHT
*   Operating Conditions: R.T., FLOWRATE=1.5 ML/MIN
*            Detector 0: 220NM/.5AU          Detector 1:
*     Misc. Information:  LENGTH=25
**********************************************************************
Starting Delay:   0.00                    Ending Retention Time:   10.00
```

Pk No.	Ret Time	Peak Area	Area %	B L	Peak Ht.	Normalized %	Area/ Height
2	1.78	89260	53.0494	2	5100	100.000	17.5
3	1.93	25796	15.3310	2	4619	28.899	5.6
4	2.03	53203	31.6196	2	4863	59.604	10.9

Total Area: 168258 Area Reject: 1000 One sample per 1.000 sec.

DATA FILE=PHEN028 FROM 0.00 MIN. TO 10.00 MIN. LOW SCALE= 5.422 Mv. HIGH SCALE= 10.700 Mv.
USP-39A, 3-1, C=6.93 MG/ML, 8/5/86, JGZ

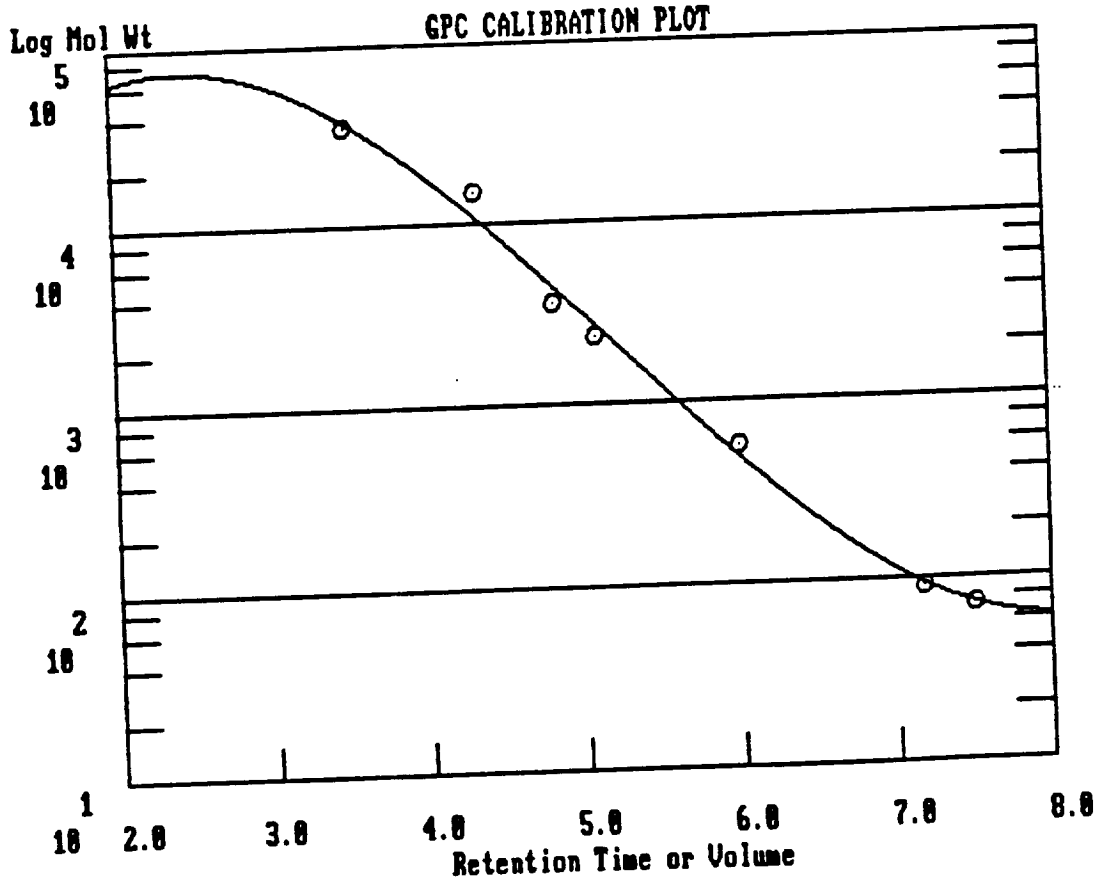


ORIGINAL PAGE IS
OF POOR QUALITY

*** Calibration Data ***
Calibration Name:
Misc Information:

Fit Type: 3
Log Mol Wt = A + Bx + Cx^2 + Dx^3
A= 2.538977 B= 2.115815 C= -.5646824 D= 3.606432E-02
Coefficient of Determination: 0.9902

Ret Time	Molecular Weight	Log Mol Wt
3.50	35000	4.544
4.33	15000	4.176
4.83	3600	3.556
5.09	2350	3.371
6.00	570	2.756
7.17	92	1.964
7.50	72	1.857



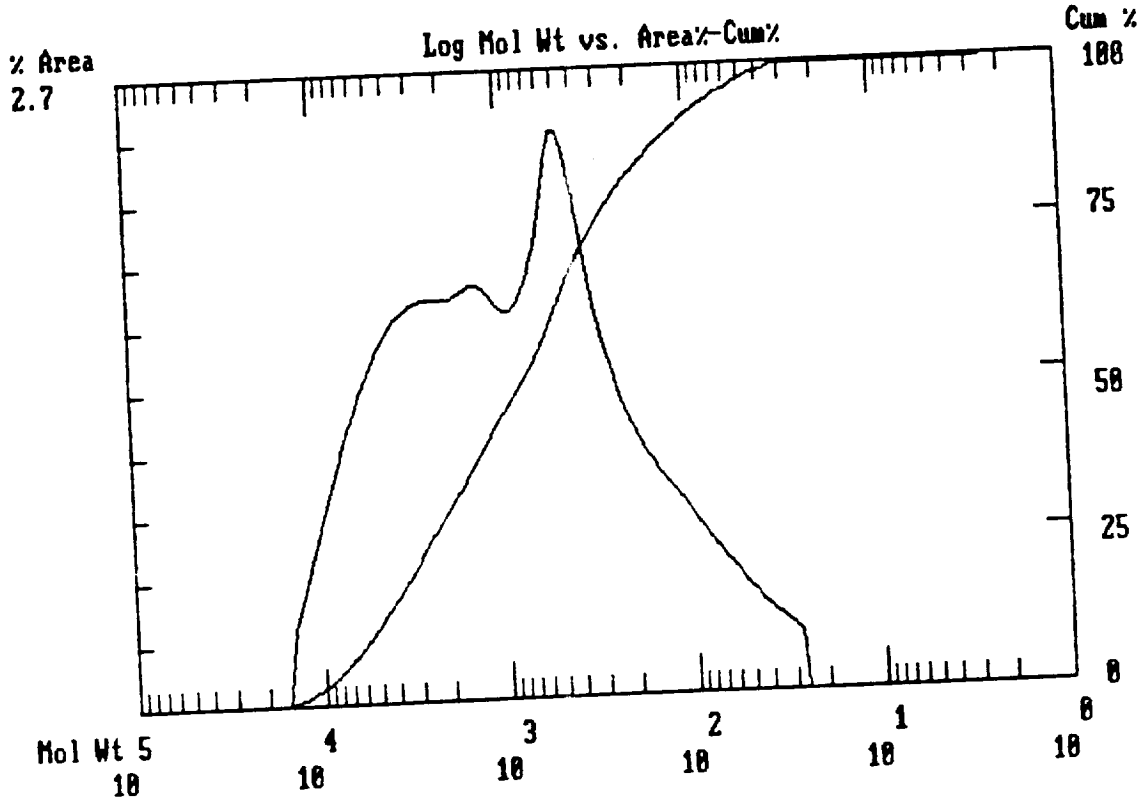
ORIGINAL PAGE IS
OF POOR QUALITY

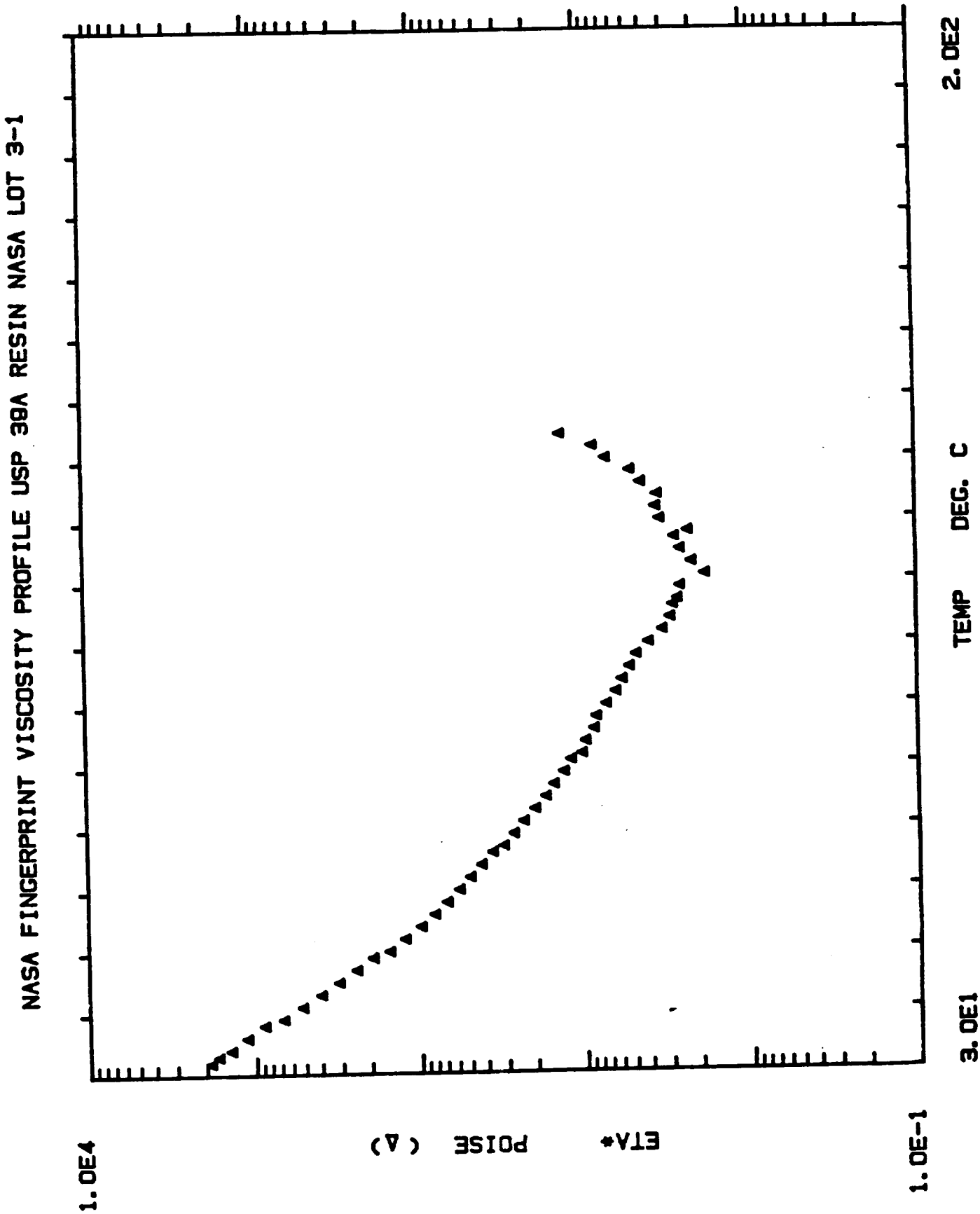
FILE A:GPC35.HDR TAKEN 08-05-1986 17:53:34

******** GPC REPORT ********

Sample Name: USP39A 3-1=2.68
Date: 08-05-1986 16:21:21 Method:
Interface: 5 Cycle#: 35
Starting Peak Width: 60 Threshold: 0
Operator Initials: GBF
DATA FILE: A:GPC35.PTS
Channel#: 0 Vial#: N.A.
Column Type: ULTRASTYRAGEL 500A
Instrument Type: HPLC/BECKMAN
Solvent Description: THF
Operating Conditions: T=35C FLOWRATE=2.0ML/MIN
Detector 0: 254NM/.1AU
Detector 1:
Misc. Information: CALIBRATION/GPC
Ending Retention Time: 10.00
Starting Delay: 0.00
Calibration file: GPCPHEN
Molecular Weight Distribution Averages

Baseline TIMES:	3.85 to	10.00	MW:	22295 to	2
Process TIMES:	3.85 to	10.00	MW:	22295 to	2
Total Area:	203112				
Mw=	1932				
Mn=	297				
Mw Mn=	6.5017				
Mz	5426				
	1642				




NASA FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT 3-1
ETA* POISE (A)
TEMP DEG. C
1.0E4
1.0E-1
2.0E2
3.0E1

Rheometrics RECAP II

Experiment No. : 4 Sample No. : 1

Title:
NASA FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT 3-1

Operator :CP

Date and Time : Friday, August 15, 1986 - 15:26:35

Operating Mode : DYNAMIC

Sweep Type : CURE

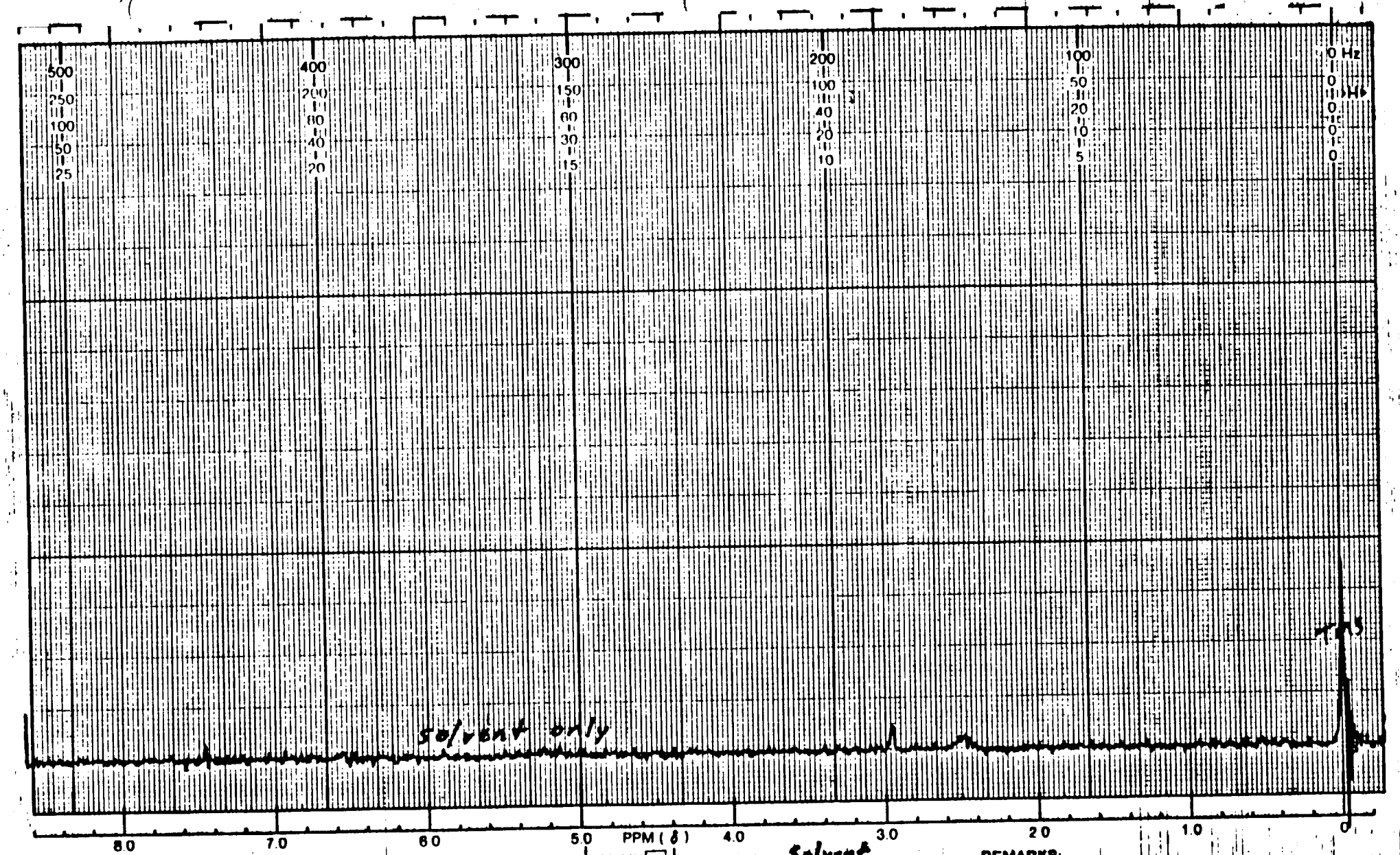
Geometry : DISK & PLATE
RADIUS : 25.00
GAP : 0.50

Notes :
STRAIN =50%
FREQUENCY =10 RAD/SEC

O.	ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
1	1.827e+003	1.826e+003	4.904e+001	2.316e+002	2.000e-001	3.200e+001
2	1.830e+003	1.829e+003	3.896e-001	2.321e+002	1.000e+000	3.200e+001
3	1.640e+003	1.640e+003	3.551e+001	2.080e+002	2.000e+000	3.300e+001
4	1.376e+003	1.376e+003	3.174e+001	1.742e+002	3.000e+000	3.400e+001
5	1.096e+003	1.096e+003	2.514e+001	1.385e+002	4.000e+000	3.600e+001
6	8.598e+002	8.596e+002	2.120e+001	1.086e+002	5.000e+000	3.800e+001
7	6.593e+002	6.589e+002	2.233e+001	8.311e+001	6.000e+000	3.900e+001
8	5.063e+002	5.058e+002	2.205e+001	6.380e+001	7.000e+000	4.100e+001
9	3.902e+002	3.897e+002	2.009e+001	4.915e+001	8.000e+000	4.300e+001
10	3.032e+002	3.026e+002	2.016e+001	3.815e+001	9.000e+000	4.500e+001
11	2.362e+002	2.354e+002	2.004e+001	2.972e+001	1.000e+001	4.700e+001
12	1.873e+002	1.862e+002	2.007e+001	2.354e+001	1.100e+001	4.900e+001
13	1.488e+002	1.476e+002	1.913e+001	1.871e+001	1.200e+001	5.000e+001
14	1.200e+002	1.186e+002	1.818e+001	1.507e+001	1.300e+001	5.200e+001
15	9.599e+001	9.484e+001	1.479e+001	1.206e+001	1.400e+001	5.400e+001
16	7.890e+001	7.793e+001	1.230e+001	9.907e+000	1.500e+001	5.600e+001
17	6.639e+001	6.550e+001	1.092e+001	8.341e+000	1.600e+001	5.800e+001
18	5.590e+001	5.513e+001	9.240e+000	7.026e+000	1.700e+001	6.000e+001
19	4.797e+001	4.733e+001	7.814e+000	6.021e+000	1.800e+001	6.200e+001
20	4.102e+001	4.046e+001	6.764e+000	5.151e+000	1.900e+001	6.400e+001
21	3.510e+001	3.463e+001	5.702e+000	4.404e+000	2.000e+001	6.600e+001
22	3.006e+001	2.968e+001	4.734e+000	3.774e+000	2.100e+001	6.700e+001
23	2.608e+001	2.573e+001	4.225e+000	3.272e+000	2.200e+001	6.900e+001
24	2.257e+001	2.228e+001	3.622e+000	2.834e+000	2.300e+001	7.100e+001
25	1.929e+001	1.904e+001	3.129e+000	2.424e+000	2.400e+001	7.300e+001
26	1.656e+001	1.636e+001	2.592e+000	2.077e+000	2.500e+001	7.500e+001
27	1.472e+001	1.454e+001	2.279e+000	1.850e+000	2.600e+001	7.700e+001
28	1.330e+001	1.262e+001	2.161e+000	1.607e+000	2.700e+001	7.900e+001
29	1.155e+001	1.135e+001	2.176e+000	1.451e+000	2.800e+001	8.100e+001
30	9.981e+000	9.736e+000	1.688e+000	1.240e+000	2.900e+001	8.200e+001
31	9.387e+000	9.266e+000	1.504e+000	1.179e+000	3.000e+001	8.400e+001
32	8.299e+000	8.216e+000	1.170e+000	1.043e+000	3.100e+001	8.600e+001
33	8.047e+000	7.971e+000	1.102e+000	1.010e+000	3.200e+001	8.800e+001
34	6.981e+000	6.935e+000	8.019e-001	8.771e-001	3.300e+001	9.000e+001
35	6.092e+000	6.035e+000	8.276e-001	7.648e-001	3.400e+001	9.200e+001
36	5.588e+000	5.549e+000	6.617e-001	7.020e-001	3.500e+001	9.400e+001
37	5.038e+000	5.020e+000	4.197e-001	6.330e-001	3.600e+001	9.600e+001
38	4.581e+000	4.579e+000	1.556e-001	5.751e-001	3.700e+001	9.800e+001
39	3.851e+000	3.846e+000	1.960e-001	4.837e-001	3.800e+001	1.000e+002
40	3.181e+000	3.171e+000	2.447e-001	3.992e-001	3.900e+001	1.020e+002
41	2.850e+000	2.840e+000	2.398e-001	3.580e-001	4.000e+001	1.040e+002
42	2.731e+000	2.716e+000	2.832e-001	3.428e-001	4.100e+001	1.060e+002
43	2.562e+000	2.464e+000	7.029e-001	3.219e-001	4.200e+001	1.070e+002
44	2.467e+000	2.107e+000	1.283e+000	3.095e-001	4.300e+001	1.090e+002
45	1.730e+000	1.578e+000	7.560e-001	2.198e-001	4.400e+001	1.110e+002
46	2.104e+000	1.951e+000	7.875e-001	2.644e-001	4.500e+001	1.130e+002
47	2.460e+000	2.178e+000	1.143e+000	3.089e-001	4.600e+001	1.150e+002
48	2.662e+000	2.344e+000	1.262e+000	3.343e-001	4.700e+001	1.170e+002
49	2.198e+000	1.876e+000	1.146e+000	2.759e-001	4.800e+001	1.180e+002
50	3.239e+000	2.684e+000	1.796e+000	4.056e-001	4.900e+001	1.200e+002

FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT 3-1

NO.	ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
[illegible]	3.422e+000	2.934e+000	1.761e+000	4.397e-001	5.000e+001	1.220e+002
[illegible]	3.324e+000	2.903e+000	1.619e+000	4.175e-001	5.100e+001	1.240e+002
53	4.180e+000	3.654e+000	2.032e+000	5.247e-001	5.200e+001	1.260e+002
54	4.842e+000	4.446e+000	1.918e+000	6.081e-001	5.300e+001	1.280e+002
55	6.760e+000	6.299e+000	2.453e+000	8.497e-001	5.400e+001	1.300e+002
56	8.108e+000	7.529e+000	3.010e+000	1.018e+000	5.500e+001	1.320e+002
57	1.276e+001	1.180e+001	4.853e+000	1.603e+000	5.600e+001	1.340e+002



SWEEP OFFSET (Hz): 0
SPECTRUM AMPLITUDE: 2.0
INTEGRAL AMPLITUDE: —
SPINNING RATE (RPS): 30

MANUAL
SWEEP TIME (SEC): 30 250 500 1000
SWEEP WIDTH (Hz): 25 50 100 250 500
FILTER: 1 2 3 4 5 6 7 8
RF POWER LEVEL: 0.30

AUTO ☐
(250)
(500)
(2)
(.05)

SAMPLE: Solvent
SOLVENT: Uniol-d + 0.82 TMS
DEC. LEVEL

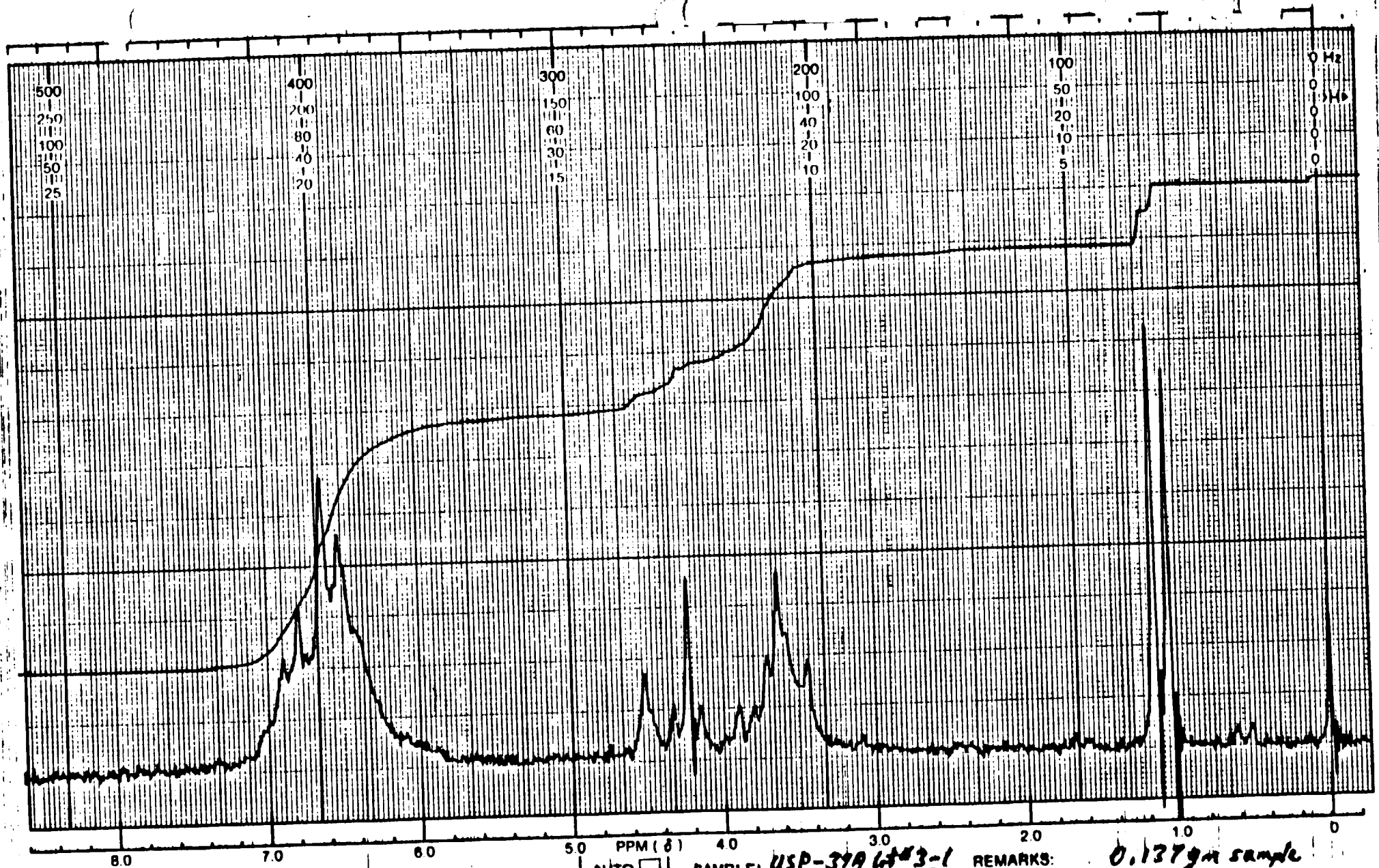
REMARKS:

SOLVENT ONLY SCAN

ORIGINAL PAGE IS OF POOR QUALITY

NORELL, INC.
LANDISVILLE, N.J. 08326
TEC Phone: (609) 697-0020

DATE: 3-21-86
OPERATOR DGW
SPECTRUM NO. 1A of 7
solvent scan



SWEEP OFFSET (Hz): 0
SPECTRUM AMPLITUDE: 8.0
INTEGRAL AMPLITUDE: 5.0
SPINNING RATE (RPS): 30

MANUAL
SWEEP TIME (SEC): 50 | 250 | 500 | 1000
SWEEP WIDTH (Hz): 25 | 50 | 100 | 250 | 500
FILTER: 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8
RF POWER LEVEL: 0.25

AUTO ☐
(250)
(500)
(2)
(.05)

SAMPLE: USP-39A Lot#3-1
SOLVENT: Unisol-d + 0.5% TMS
DEG. LEVEL

REMARKS: 0.137 gm sample
0.937 gm solvent

ORIGINAL OF POOR QUALITY

CHART 15A

NORELL, INC.
LANDISVILLE, N.J. 08326

DATE: 3-21-86

OPERATOR DOV

SPECTRUM NO. 5 of 7 USP-39A
Lot#3-1

TABLE OF CONTENTS

FABRIC TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

WCA Fabric for NASA Lot# 3 (KAISER)

CHARTS

U.S Polymeric

FABRIC TESTING

NAS8-36298

U.S. POLYMERIC O.E. 71108

WCA Fabric for NASA Lot# 3 (KAISER)

		#3-1E
1a. Breaking Strength, lbs/in, WARP ASTM D1682	PICK	35
	CENTER	52
	PLAIN	53
	AVG.	46.7
1b. Breaking Strength, lbs/in, FILL ASTM D1682	PICK	17
	CENTER	25
	PLAIN	31
	AVG.	24.3
2a. Carbon Assay, % MDQAI 5560	PICK	99.5
	CENTER	99.9
	PLAIN	99.6
	AVG.	99.67
2b. Hydrogen Assay, % MDQAI 5560	PICK	.02
	CENTER	<.01
	PLAIN	<.01
	AVG.	EST .007
2c. Nitrogen Assay, % MDQAI 5560	PICK	.03
	CENTER	.03
	PLAIN	.05
	AVG.	EST .037
3. Visual Inspection QCi-102		See Chart 3A
4. Specific Gravity, Units PTM-84		1.6432
		1.6408
		1.6187
	AVG.	1.634
5. pH, Units CTM-24B		6.4
		6.4
	AVG.	6.4
6. TGA, •C at 50% Weight Loss CTM-51 (AIR)		SET UP #1
		#3-1E 949
		See Chart 6A

HITCO MATERIALS DIVISION
700 E. DYER ROAD, SANTA ANA, CALIFORNIA 92707 • (714) 549-1101 • TWX (910) 595-1130 • FAX # (714) 549-2858-5-2437

WCA Fabric for NASA Lot# 3 (KAISER)

7a. Atomic Absorption, ppm
CTM-53B

	#3-1E
Na	9
K	0
Ca	6
Mg	3
Li	0
AVG.	18

7b. Moisture Content, %
CTM-53B — .030

7c. Ash Content, %
CTM-53B — .015

8a. Filament diameter, microns, WARP
S.E.M. procedure
(diameters are an average 10 measurements)

	#3-1E
AVERAGE	10.19
Minimum	9.05
Maximum	12.05
Std. Dev	0.97

9a. Thread Count, per inch, WARP
PTM-5A

#3-1E
29
29
29
29
29
AVG. 29.0

9b. Thread Count, per inch, FILL
PTM-5A

22
22
22
22
22
AVG. 22.0

10a. Areal weight as received, gm/4x4
PTM-3A

LEFT	2.495
CENTER	2.480
RIGHT	2.506
AVG.	2.494

10b. Volatiles as received, %
PTM-3A

LEFT	.40
CENTER	.36
RIGHT	.40
AVG.	.39

WCA Fabric for NASA Lot# 3 (KAISER)

10c. Weight Change on Acetone Wash, %
PTM-3A

	#3-1E
LEFT	.04
CENTER	-.08
RIGHT	.08
AVG.	.01

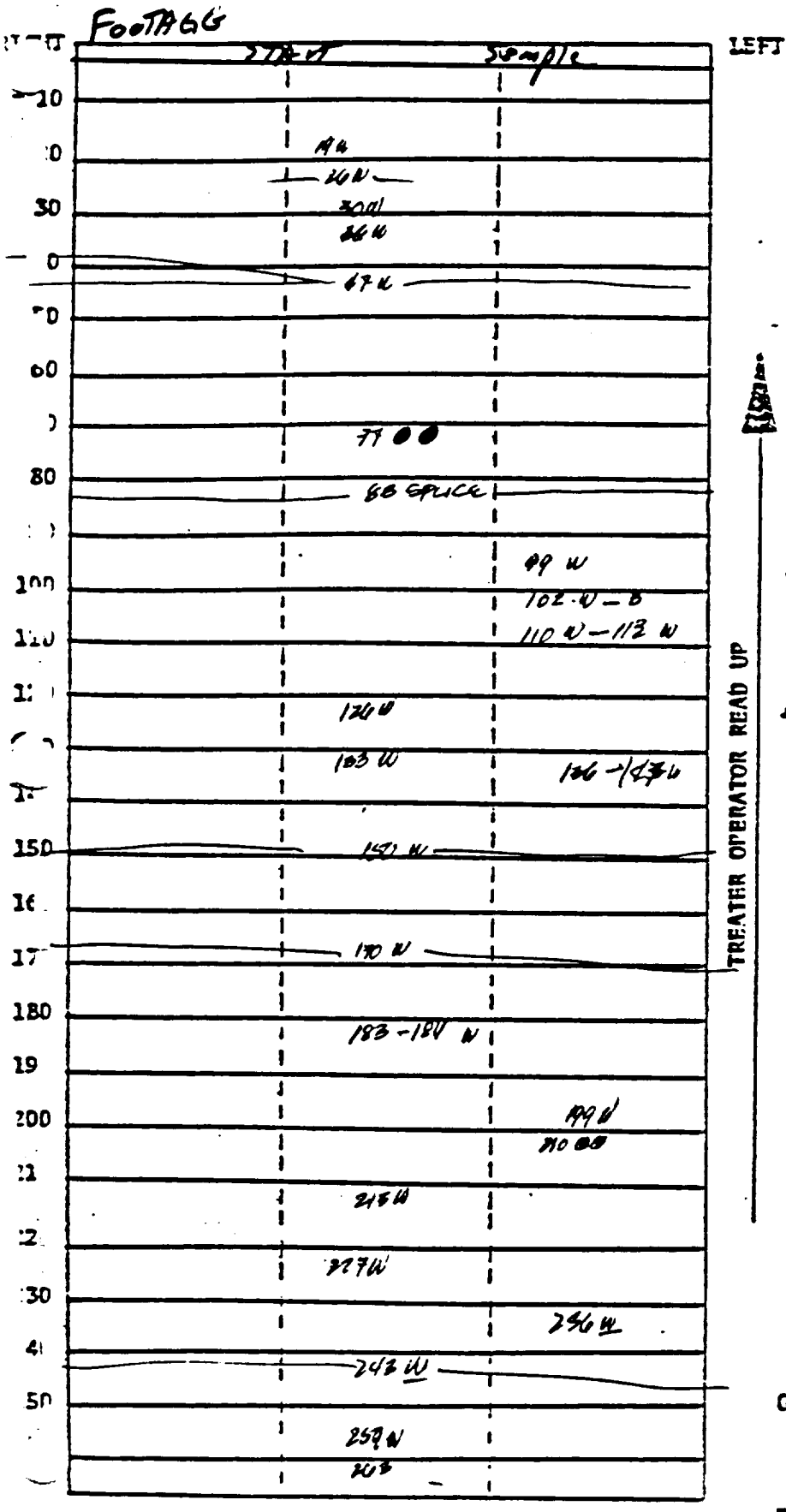
U.S. Polymeric

Hamid M. Quraishi

Hamid M. Quraishi, Manager
Quality Assurance Department

ORIGINAL PAGE IS
OF POOR QUALITY

USP NO. ___ CHART 3A ___



DATE 8/17/86

FABRIC WCA GRAPHITE

MFG. UNION CARBIDE

ROLL NO. 804 12C5 WCA-2

YARDS 180

POUNDS 100

ORDER NO. OE71108

SPECIFICATION VARIOUS

Q.C. FILE # NASA 3-1

SYMBOLS

- TEAR
- SPOTS OR STAINS
- FOLDS
- EDGE CURL
- TIGHT WEAVE OR SELVAGE
- WEAVE DISTORTION
- VISIBLE PUCKERS
- ONE PUCKER CREASING
- TWO OR MORE CREASINGS

REMARKS

272 W
282 W
290 W
296 W
204 W
209 W
313 W
324 W
334 SPLICE
336 W
348 W
352 W
355 W

360 W
364 W
366 W
374 W
377 W
391 W
400 W
404 W
406 – 7 W

422 W
424 W
432 W
4396
451 W
460 OO
472 W
480 OO
482 W
485 W
492 W
495 W
510 W
511 W
518 W
524 W

GRADE Group C

END Sample

ORIGINAL PAGE IS
OF POOR QUALITY

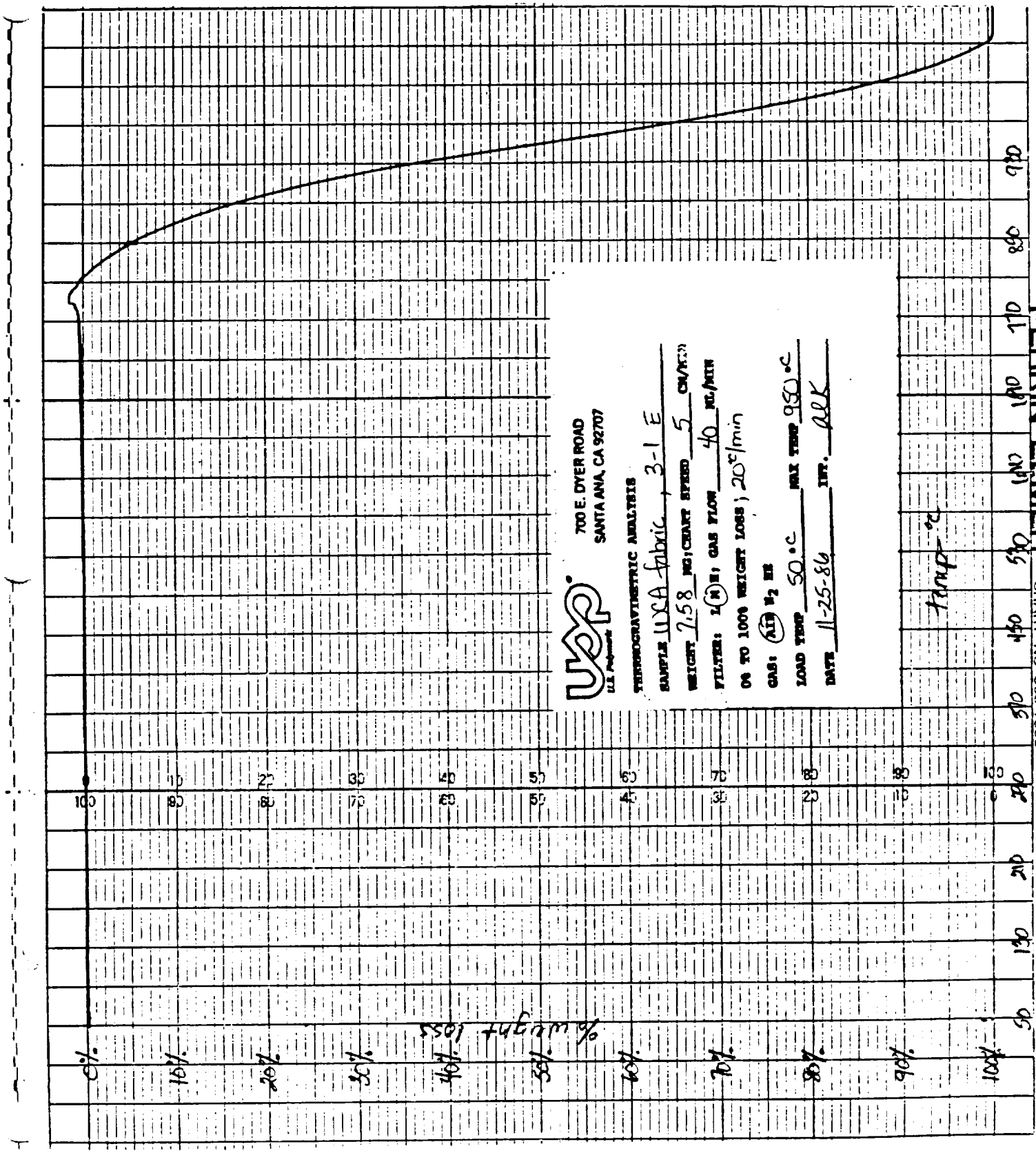


TABLE OF CONTENTS

PREPREG TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

FM 5064J NASA LOT# 3 U.S.P. LOT# C02138 (KAISER)

CHARTS

U.S. Polymeric

PREPREG TESTING

NAS8-36298

U.S. POLYMERIC O.E.71108

FM 5064J NASA LOT# 3 U.S.P. LOT# C02138 (KAISER)

		ROLL#1-S
1a. Resin Content, Soxhlet, % CTM-6D		33.3
		33.9
		32.7
	AVG.	33.3
1b. Filler Content, Soxhlet, % CTM-6D		13.6
		13.8
		13.4
	AVG.	13.6
1c. Cloth Content, Soxhlet, % CTM-6D		53.1
		52.3
		53.9
	AVG.	53.1
2. Volatile Content, % PTM-17B		2.2
		2.0
		1.8
	AVG.	2.0
3. Flow, 1000 psi, % PTM-19G		11.8
		16.0
		17.0
	AVG.	14.9
4. Resin Content, Dry basis, % PTM-16F, Type II		33.8
		34.7
		34.2
	AVG.	34.2
5. Tack, lbs PTM-80		15
6. Gel Time, seconds PTM-20E		54
7a. Atomic Absorption, ppm CTM-53B	Na	5
	K	0
	Ca	0
	Mg	6
	Li	0
	TOTAL	11
7b. Moisture Content, % CTM-53B		1.76

HITCO MATERIALS DIVISION
700 E. DYER ROAD, SANTA ANA, CALIFORNIA 92707 • (714) 549-1101 • TWX (910) 595-1130 • FAX # (714) 549-2858-5-2437

FM 5064J NASA LOT# 3 U.S.P. LOT# C02138 (KAISER)

		ROLL#1-S
7c. Ash Content, % CTM-53B		.22
8. TGA, % Weight Loss at 500°C CTM-51 (Nitrogen)	See Chart 8A	9.2
9. DSC, °C CTM-50A	First Temp See Chart 9A	180
10. Infrared (IRZB) Baseline CTM-21C	See Chart 10A	.82
11. Environmental History	Date manufactured: 2 May 1986 Packaged in: MIL-B-131 Class I bag supported in cardboard carton Date shipped: 16 June 1986 in 40°F truck	
12. Specific Gravity, Cured, Units ASTM D792		1.435 1.436 1.435
	AVG.	1.435
13a. Tensile Strength, ksi, WARP FTMS 406-1011		19.20 19.76 19.05 17.08 19.50
	AVG.	18.92
13b. Tensile Modulus, msi, WARP FTMS 406-1011		1.77 1.85 1.96 1.93 2.03
	AVG.	1.91
13c. Tensile Elongation, %, WARP FTMS 406-1011		.84 1.40 1.28 1.13 --
	AVG.	1.16
14a. Flexural Strength, ksi, WARP FTMS 406-1031		27.34 27.45 24.89 28.50 27.55
	AVG.	27.15

FM 5064J NASA LOT# 3 U.S.P. LOT# C02138 (KAISER)

		ROLL#1-S
14b. Flexural Modulus, msi, WARP FTMS 406-1031		1.49
		1.60
		1.55
		1.78
		1.55
	AVG.	1.59
15a. Compressive Strength, ksi, WARP FTMS 406-1021		19.80
		19.13
		15.90
		20.25
		19.47
	AVG.	18.91
15b. Compressive Modulus, msi, WARP FTMS 406-1021		2.20
		2.29
		2.21
		1.93
		2.14
	AVG.	2.15
16. Double Shear Strength, ksi FTMS 406-1041A		2.79
		2.81
		2.75
		2.76
		2.56
	AVG.	2.73
17. Barcol Hardness, Units ASTM D-2583 (Average of 10 determinations)		61.9
18. Residual Volatiles, % PTM-98		.83
		.90
		1.08
	AVG.	.93
19. Resin Content, Pyrolysis, % CTM-14B		30.06
		31.20
		30.14
	AVG.	30.47
20. Acetone Extraction, % CTM-18A		3.22
		3.40
		4.04
	AVG.	3.56
21a. CTE, in/in °F with PLY PTM-61B		4.04
		2.06
	AVG.	3.05

FM 5064J NASA LOT# 3 U.S.P. LOT# C02138 (KAISER)

21b. CTE, in/in °F Cross PLY
PTM-61B

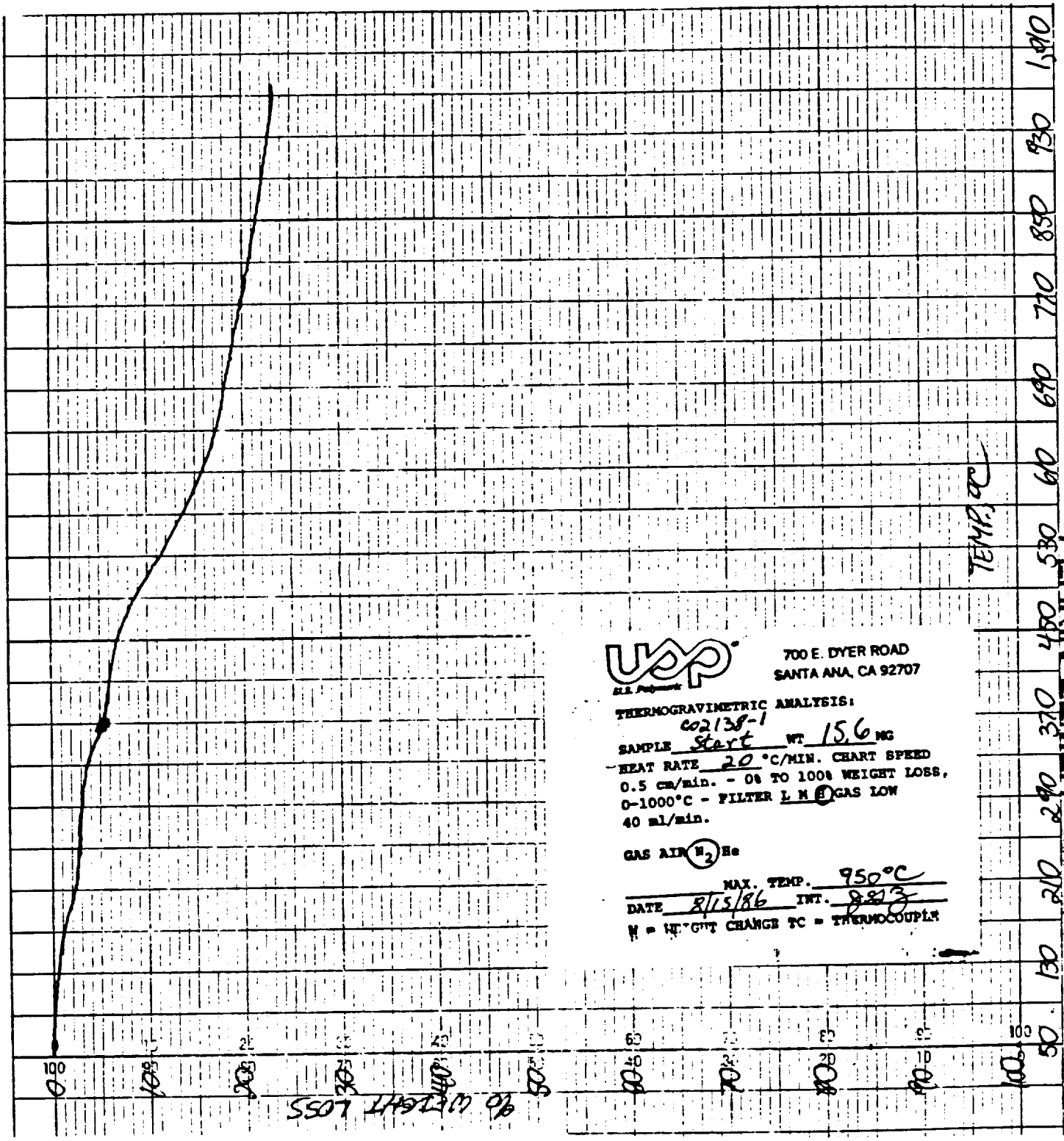
	8.29
	13.37
AVG.	10.83

See Chart 21A

U.S. Polymeric

Hamid M. Quraishi, Manager
Quality Assurance Department

CHART 8A



USP
U.S. Polymeric

700 E. DYER ROAD
SANTA ANA, CA 92707

THERMOGRAVIMETRIC ANALYSIS:

SAMPLE co2138-1 start WT 15.6 MG

HEAT RATE 20 °C/MIN. CHART SPEED 0.5 cm/min. - 0% TO 100% WEIGHT LOSS, 0-1000°C - FILTER L M H GAS LOW 40 ml/min.

GAS AIR (N2) He

MAX. TEMP. 950°C

DATE 8/15/86 INT. 883

W = WEIGHT CHANGE TC = THERMOCOUPLE

CHART 9A

U.S. POLYMERIC DSC-2

Sample: CO2 PSX-11 Short Wt: 15.1 mg
Heat Rate: 20 °C/min Range: 2.0 mcals/sec
Recorder Span: 50 mV Chart speed: 10 min/min
Temp. Limits: Lower 50 ° Upper 350 °
Ht's: Hold/Autocool/Cycle Cooling Rate: 320 °C/min.
Operator: A.K. Date: 9-17-92

9-15-92 LAST CALIBRATION DATE
0° CALIBRATION DELTA °C

EXOTHERM

180°

CHART NO. RN2-01-25-20M

ORIGINAL PAGE IS
OF POOR QUALITY

ORIGINAL PAGE IS
OF POOR QUALITY

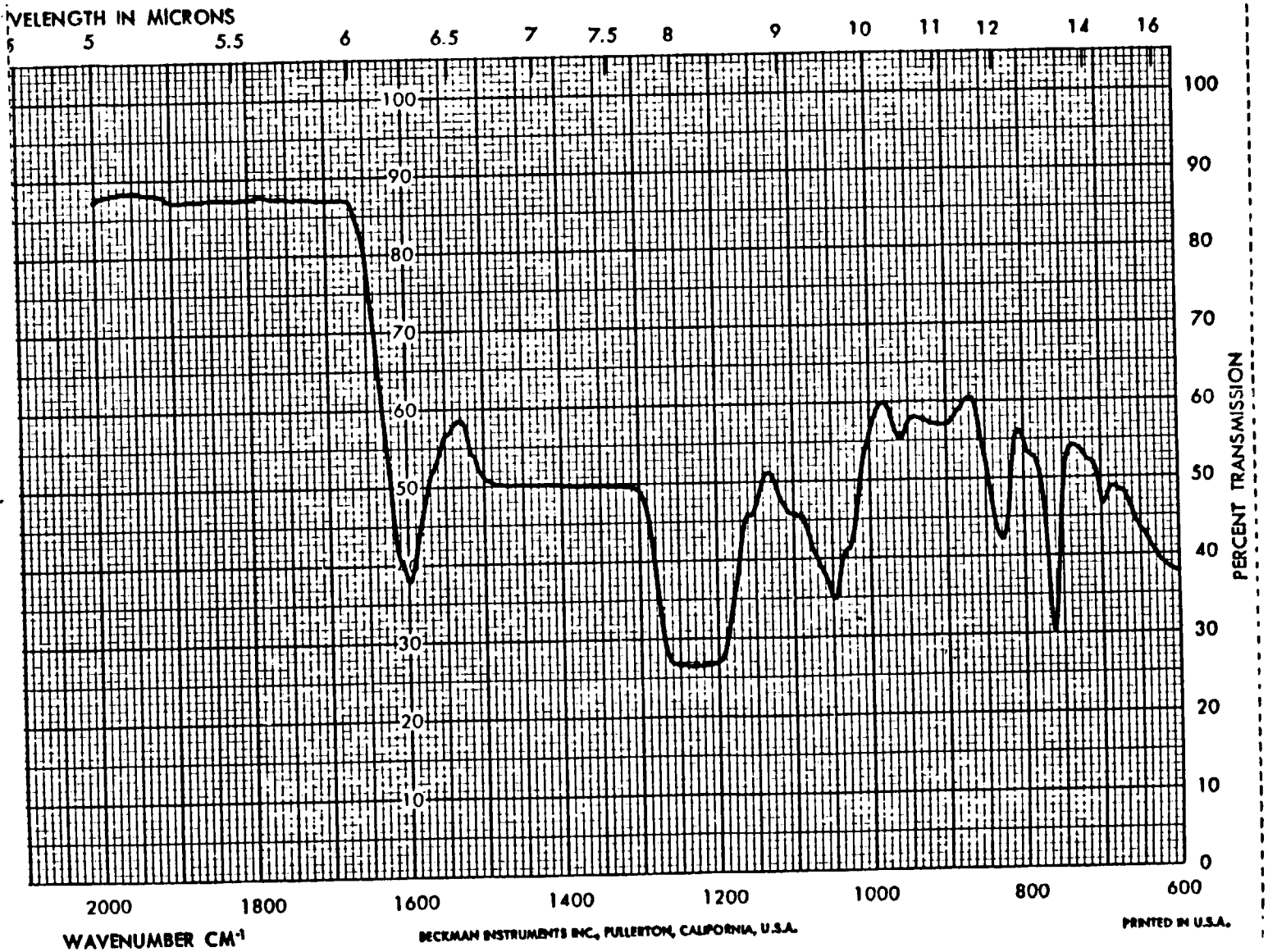
SPECTRUM NO. 15187
DATE 7-07-86
SAMPLE FM 5064 J
CO2138 # 1

SOURCE
STRUCTURE

PATH 0.2 mm NACL
SOLVENT ACETONE
CONCENTRATION 30-50 %T
PHASE 3
COMMENTS PRE-PREG
MATERIAL

ANALYST V. MIRANDA

Beckman®
INFRARED
SPECTROPHOTOMETER

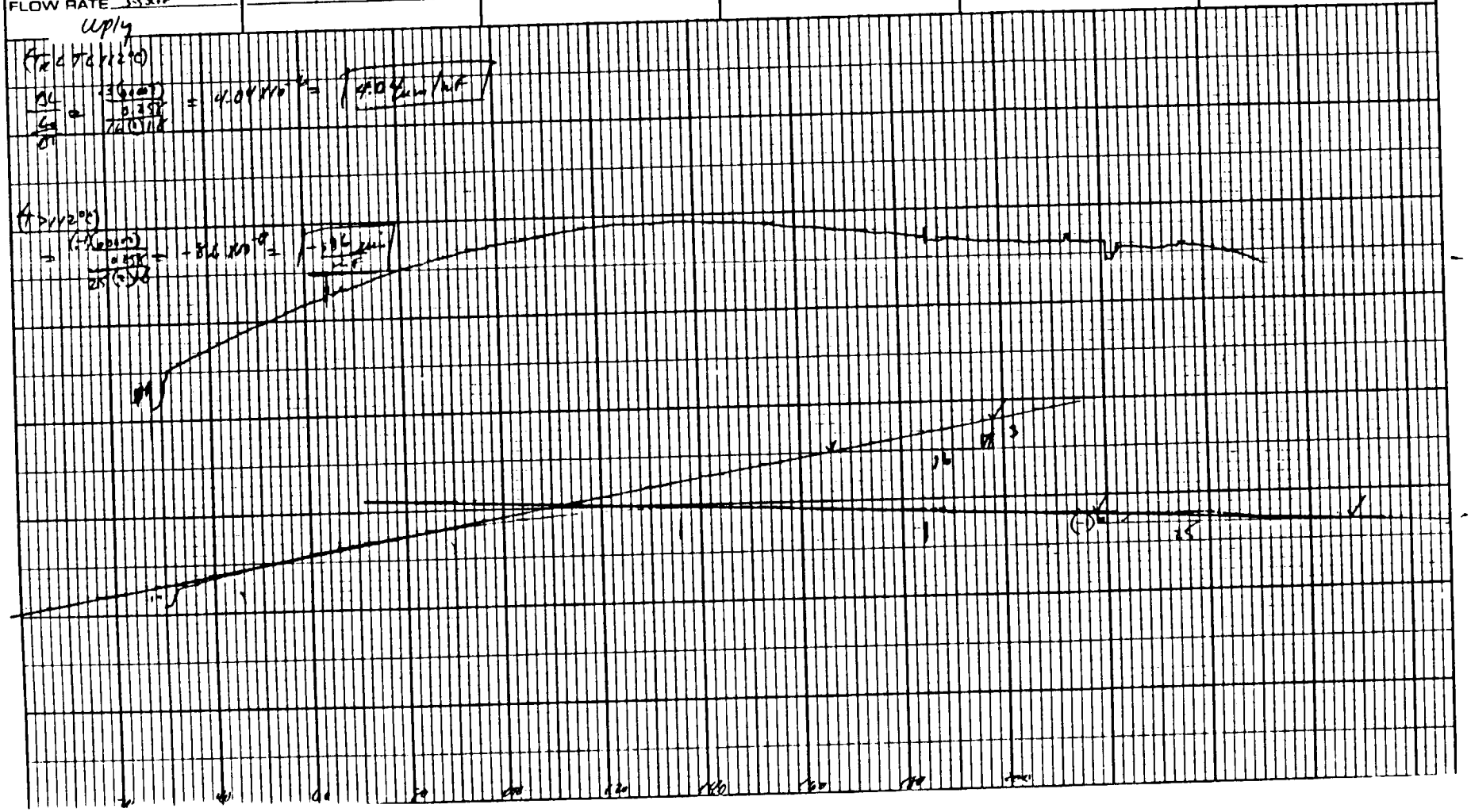


BECKMAN INSTRUMENTS INC., FULLERTON, CALIFORNIA, U.S.A.
PRINTED IN U.S.A.

CHART 10A

PART NO. 990088

RUN NO. ___ DATE 9/20/84	T-AXIS	DTA-DSC	TGA	TMA	
OPERATOR TH	SCALE, °C/in 50 20	SCALE, °C/in	SCALE, mg/in	SCALE, mils/in 0.1/0.2	
SAMPLE: C02138-1-START-(1)	PROG. RATE, °C/min 10	(mcal/sec)/in	SUPPRESSION, mg	MODE EXPANSION	
ATM Air @ STP	HEAT ✓ COOL ___ ISO ___	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE 0.258	
FLOW RATE 3-5SCFH	SHIFT, in 0	REFERENCE	TIME CONST., sec	LOAD, g 11	
up/y			dY, (mg/min) /in	dY, (10X), (mils/min)/in	



MEASURED VARIABLE

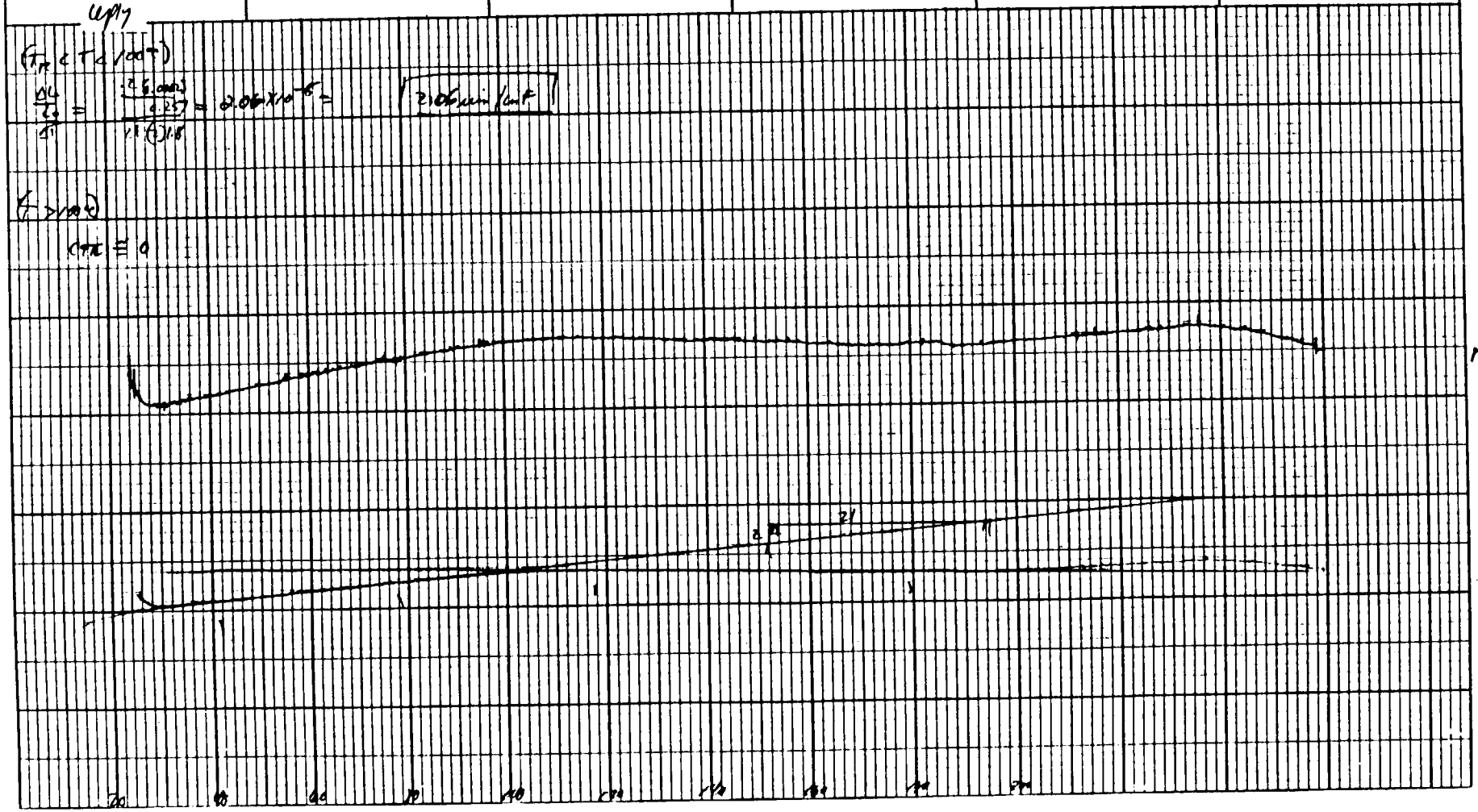
DUPONT Instruments

Chart 21A1

PART NO. 990088

RUN NO ___ DATE 9/20/84	T-AXIS	DTA-DSC	TGA	TMA	
OPERATOR TH	SCALE, °C/in 50 20	SCALE, °C/in	SCALE, mg/in	SCALE, mils/in 0.1/0.2	
SAMPLE:	PROG. RATE, °C/min 10	(mcal/sec)/in	SUPPRESSION, mg	MODE Expansion	
CO 2138 - 1 - START - (2)	HEAT / COOL ___ ISO ___	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE 0.257	
ATM Air @ STP	SHIFT, in 0	REFERENCE	TIME CONST, sec	LOAD, g 1	
FLOW RATE 25 cc/m			dY, (mg/min) /in	dY, (10X), (mils/min)/in	

upon



MEASURED VARIABLE

DUPONT Instruments

ORIGINAL PAGE IS
OF POOR QUALITY

Chart 21A2

Chart 21A3

PART NO. 990088

RUN NO. ____ DATE 4/19/90

OPERATOR TR

SAMPLE

ATM Air @ 30 SCFH

FLOW RATE 3-5 SCFH

T-AXIS

SCALE, °C/in 50 20

PROG. RATE, °C/min 1'

HEAT ✓ COOL ___ ISO ___

SHIFT, in 0

DTA-DSC

SCALE, °C/in ___

(mcal/sec)/in ___

WEIGHT, mg ___

REFERENCE ___

TGA

SCALE, mg/in ___

SUPPRESSION, mg ___

WEIGHT, mg ___

TIME CONST., sec ___

dY/dT (mg/min)/in ___

TMA

SCALE, mils/in 0.1/0.4

MODE Expansion

SAMPLE SIZE 0.134

LOAD, g 10

dY/dT (10X) (mils/min)/in ___

MEASURED VARIABLE

DUPONT Instruments

ORIGINAL PAGE IS
OF POOR QUALITY

Chart 21A4

PART NO. 990088

RUN NO ___ DATE 4/15/96
OPERATOR PJ
SAMPLE
C02138-1-START-(5)
ATM AIR @ 100
FLOW RATE 3-55(cc)
X9/7

T-AXIS
SCALE, °C/in 50-20
PROG. RATE, °C/min 10
HEAT ✓ COOL ___ ISO ___
SHIFT, in 0

DTA-DSC
SCALE, °C/in ___
(mcal/sec)/in ___
WEIGHT, mg ___
REFERENCE ___

TGA
SCALE, mg/in ___
SUPPRESSION, mg ___
WEIGHT, mg ___
TIME CONST., sec ___
dY, (mg/min) /in ___

TMA
SCALE, mils/in 0.1/0.2
MODE Expansion
SAMPLE SIZE 0.134
LOAD, g 10
dY, (10X), (mils/min) /in ___

DU PONT Instruments

MEASURED VARIABLE

TABLE OF CONTENTS

FILLER TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

Filler Lot for NASA Lot# 4

CHARTS

U.S. Polymeric

FILLER TESTING

NAS8-36298

U.S. POLYMERIC O.E. 71108

Filler Lot for NASA Lot# 4

1. Carbon Content, %
   QAI-5560

	SAMPLE #4-1	#4-2	#4-3
	99.75	99.57	99.17
NASA LOT# 4 AVERAGE			99.50

2. Ash Content, %
   PTM-71B

	.005	.000	.010
	.021	.015	.005
AVG.	.013	.008	.008
NASA LOT# 4 AVERAGE			.010

3. Atomic Absorption, ppm
   CTM-53B
   (Values are average of 2 determinations)

	#4-1	#4-2	#4-3	LOT#4 AVG.
Na	2.0	2.0	1.0	1.7
K	1.5	2.0	1.0	1.5
Ca	1.5	0.5	1.5	1.2
Mg	1.0	1.0	0.0	0.7
Li	0.0	0.0	0.0	0.0
TOTAL	6.0	5.5	3.5	5.0

3a. Moisture Content, %
   CTM-53B

	0.018	0.005	0.010
	0.030	0.015	0.015
AVG.	0.024	0.010	0.013
NASA LOT# 4 AVERAGE			0.016

3b. Ash Content, %
   CTM-53B

	0.005	0.005	0.000
	0.000	0.005	0.000
AVG.	0.003	0.005	0.000
NASA LOT# 4 AVERAGE			0.003

4. pH, Units
   ASTM D1512

	4.70	4.80	4.80
	4.80	4.85	4.65
AVG.	4.75	4.82	4.72
NASA LOT# 4 AVERAGE			4.76

5. Particle Size, microns
   S.E.M. procedure
   (Average values are of 10 determinations)

AVG.	.42	.38	.43
Maximum	.56	.73	.70
Minimum	.20	.20	.23
Std. Dev	.08	.05	.08
NASA LOT# 4 AVERAGE SIZE			.41

6a. TGA, °C at 50% Loss
   CTM-51

	701	688	697
NASA LOT# 4 AVERAGE			695

HITCO MATERIALS DIVISION
700 E. DYER ROAD, SANTA ANA, CALIFORNIA 92707 • (714) 549-1101 • TWX (910) 595-1130 • FAX # (714) 549-2858-5-2437

Filler Lot for NASA Lot# 4

6b. TGA
CTM-51

See Charts 6A-6C

7. Particle Size Distribution
CTM-72

See Charts 7A-7C

7a. Particle Size, microns
CTM-72

	#4-1	#4-2	#4-3
	.94	.79	.98
	.94	.82	.91
AVG.	.94	.80	.94

NASA LOT# 4 AVERAGE .89

U.S. Polymeric

Hamid M. Quraishi

Hamid M. Quraishi, Manager
Quality Assurance Department

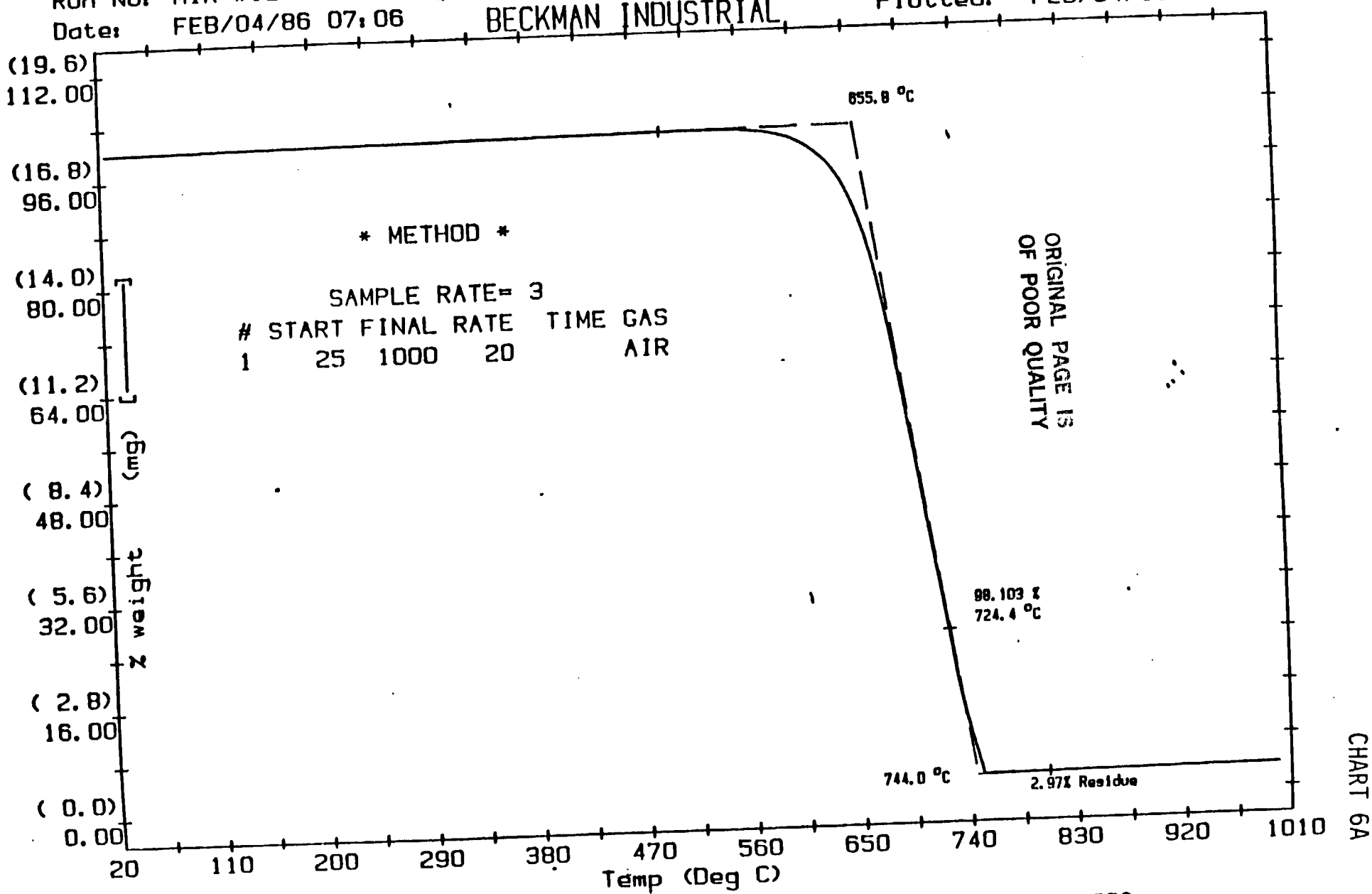
Figure #4

TGA

Sample: 4-1
Size: 17.543 mg
Run No: MIR #12831 (12)
Date: FEB/04/86 07:06

OMNITHERM DATA SYSTEM
BECKMAN INDUSTRIAL

Operator: M. WEGENER
Disk ID: DATA DISK #93
File No: D 44.DAT V2.1
Plotted: FEB/04/86 10:23



ORIGINAL PAGE IS OF POOR QUALITY

CHART 6A

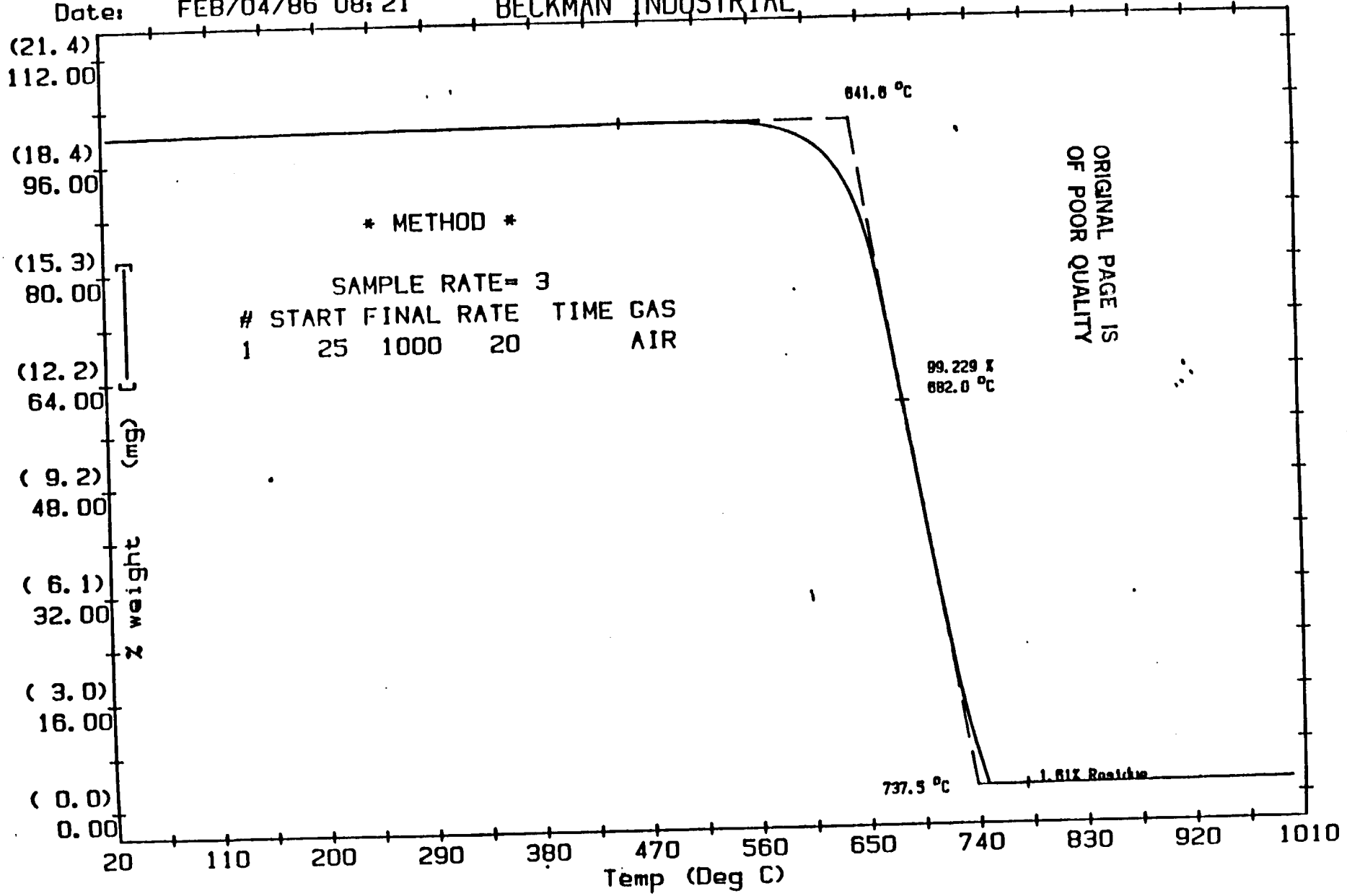
Beckman Industrial™ ANALYTICAL LABORATORY SERVICES

Sample: 4-2
Size: 19.186 mg
Run No: MIR #12831 (12)
Date: FEB/04/86 08:21

TGA.

OMNITHERM DATA SYSTEM
BECKMAN INDUSTRIAL

Operator: M. WEGENER
Disk ID: DATA DISK #93
File No: D 45.DAT V2.1
Plotted: FEB/04/86 10:54



ORIGINAL PAGE IS
OF POOR QUALITY

CHART 6B

Beckman Industrial™ ANALYTICAL LABORATORY SERVICES

FIGURE #4

TGA.

OMNITHERM DATA SYSTEM
BECKMAN INDUSTRIAL

Sample: 4-3
Size: 15.594 mg
Run No: MIR #12831 (I2)
Date: FEB/04/86 10:14

Operator: M. WEGENER
Disk ID: DATA DISK #93
File No: D 46.DAT V2.1
Plotted: FEB/04/86 11:43

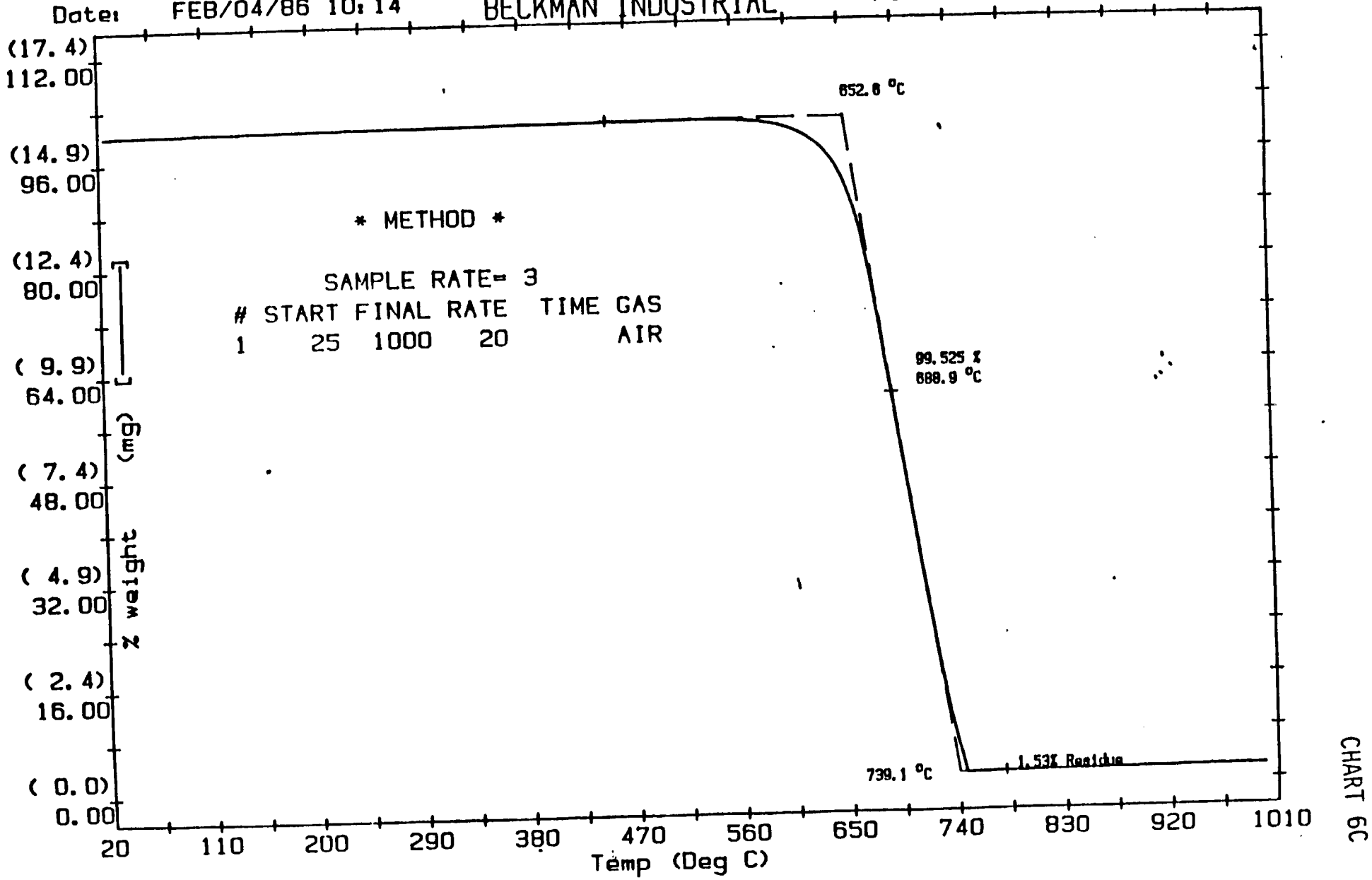


CHART 6C

Beckman Industrial™ ANALYTICAL LABORATORY SERVICES

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-27-86
#1 SAMPLE NASA LOT#4-1
SOLVENT ETHYL.GLYCOL
C=0.01 mg/ml

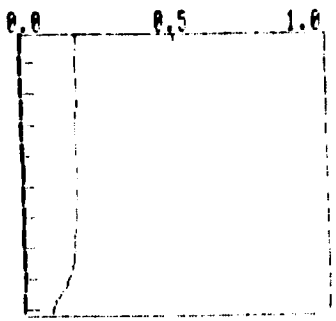
* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (PM)
D(MIN)	0.01(PM)
D(DIV)	0.50(PM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

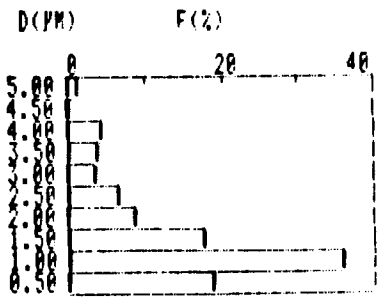


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	1.1	1.1
4.50-4.00	0.0	1.1
4.00-3.50	4.4	5.5
3.50-3.00	3.8	9.3
3.00-2.50	3.4	12.7
2.50-2.00	6.5	19.2
2.00-1.50	8.6	27.9
1.50-1.00	17.5	45.4
1.00-0.50	35.8	81.2
0.50-0.00	18.8	100.0

D(AVE) 0.94 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



LOT#4-1
Sample#1

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-27-86
#2 SAMPLE NASA LOT#4-1
SOLVENT ETHYL.GLYCOL
C=0.01 mg/ml

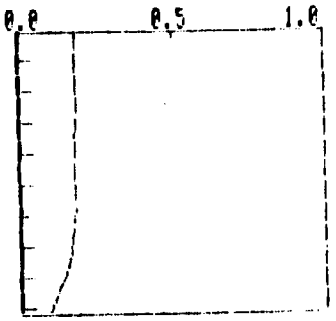
* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (PM)
D(MIN)	0.01(PM)
D(DIV)	0.50(PM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

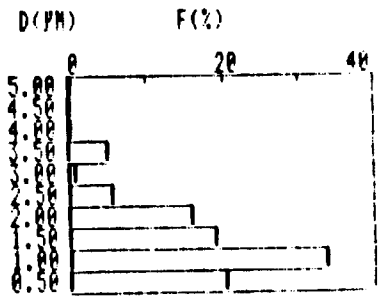


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.0	0.0
4.00-3.50	0.0	0.0
3.50-3.00	5.1	5.1
3.00-2.50	0.6	5.7
2.50-2.00	5.5	11.2
2.00-1.50	16.0	27.2
1.50-1.00	18.8	46.0
1.00-0.50	33.7	79.7
0.50-0.00	20.3	100.0

D(AVE) 0.94 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



LOT#4-1
Sample#2

CHART 7A

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-27-86
#2 SAMPLE NASA LoT#4-2
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

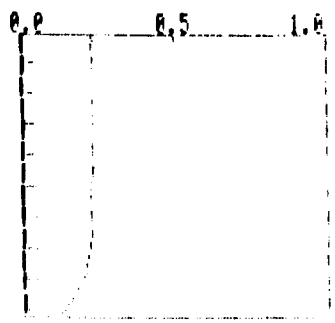
* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (PM)
D(MIN)	0.01(PM)
D(DIV)	0.50(PM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

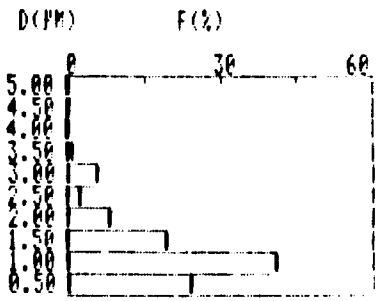


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.0	0.0
4.00-3.50	0.0	0.0
3.50-3.00	0.7	0.7
3.00-2.50	5.5	6.2
2.50-2.00	2.2	8.4
2.00-1.50	7.9	16.3
1.50-1.00	19.2	35.5
1.00-0.50	41.1	76.5
0.50-0.00	23.5	100.0

D(AVE) 0.82 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot#4-2
Sample#2

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-27-86
#1 SAMPLE NASA LoT#4-2
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

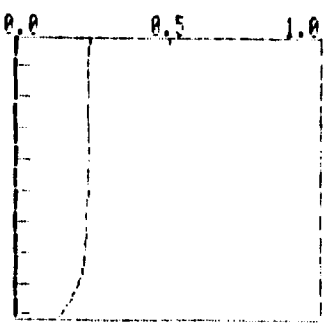
* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (PM)
D(MIN)	0.01(PM)
D(DIV)	0.50(PM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

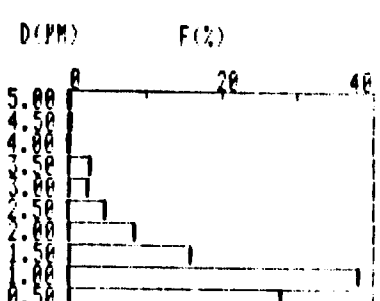


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.0	0.0
4.00-3.50	0.0	0.0
3.50-3.00	2.7	2.7
3.00-2.50	2.4	5.1
2.50-2.00	4.7	9.8
2.00-1.50	8.4	18.2
1.50-1.00	15.7	33.9
1.00-0.50	38.1	72.0
0.50-0.00	28.0	100.0

D(AVE) 0.79 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot#4-2
Sample#1

CHART 7B

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-27-86
#1 SAMPLE NASA LOT#4-3
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

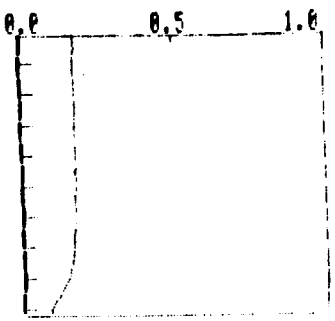
* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (PM)
D(MIN)	0.01(PM)
D(DIV)	0.50(PM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

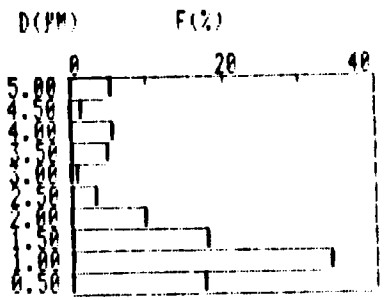


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	5.3	5.3
4.50-4.00	1.3	6.6
4.00-3.50	5.5	12.2
3.50-3.00	4.6	16.8
3.00-2.50	0.7	17.5
2.50-2.00	3.0	20.5
2.00-1.50	9.9	30.4
1.50-1.00	18.0	48.4
1.00-0.50	34.1	82.4
0.50-0.00	17.6	100.0

D(AVE) 0.98 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot#4-3
Sample #1

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-27-86
#2 SAMPLE NASA LOT#4-3
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

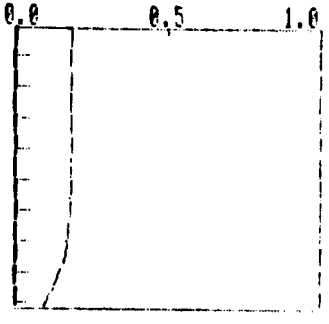
* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (PM)
D(MIN)	0.01(PM)
D(DIV)	0.50(PM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

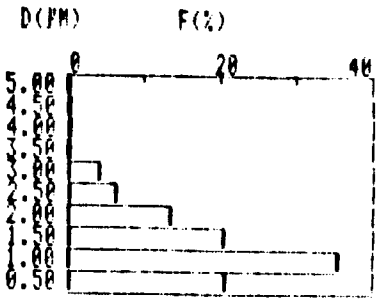


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.0	0.0
4.00-3.50	0.0	0.0
3.50-3.00	0.0	0.0
3.00-2.50	3.8	3.8
2.50-2.00	6.2	10.0
2.00-1.50	13.5	23.6
1.50-1.00	20.3	43.8
1.00-0.50	35.6	79.4
0.50-0.00	20.6	100.0

D(AVE) 0.91 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot#4-3
Sample #2

ORIGINAL PAGE IS
OF POOR QUALITY

CHART 7C

TABLE OF CONTENTS

RESIN TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

USP-39A Resin Lot for NASA Lot# 4

CHARTS

U.S. Polymeric

RESIN TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

USP-39A Resin Lot for NASA Lot# 4

		#4-1	#4-2
1. Resin Solids, % PTM-7C		83.0	82.8
		83.6	83.2
		82.4	83.5
	AVG.	83.0	83.2
	Lot# 4 AVERAGE	83.1	
2. Specific Gravity @ 25°C PTM-29C		1.167	1.169
	Lot# 4 AVERAGE	1.168	
3. Viscosity, Brookfield, cps. @ 22.8°C PTM-14C		13,750	13,500
	Lot# 4 AVERAGE	13,625	
4. Gel Time, min:sec PTM-47B		4:15	4:05
	Lot# 4 AVERAGE	4:10	

5. Atomic Absorption, ppm CTM-53B (Values are averages of two determinations)

	#4-1	#4-2	LOT4 AVG
Na	91.0	100.0	95.5
K	3.0	3.0	3.0
Ca	12.5	14.5	13.5
Mg	4.0	3.5	3.8
Li	0.0	0.0	0.0
AVG.	110.5	121.0	115.8

6. Volatiles, Gas Chromatography CTM-55 — See Charts 6A-6B

7. TGA, % Weight Loss at 500°C CTM-51 (AIR)		42.8	42.5
	Lot# 4 AVERAGE	42.7	

See Chart 7A-7B

8. DSC, temperature °C CTM-50A		186	188
	Lot# 4 AVERAGE	187	

See Chart 8A-8B

9. HPLC CTM-49A — See Chart 9A-9B

10. GPC, Average molecular wt. CTM-49A		1679	1577
	Lot# 4 AVERAGE	1628	

See Chart 10A-10B

HITCO MATERIALS DIVISION
700 E. DYER ROAD, SANTA ANA, CALIFORNIA 92707 • (714) 549-1101 • TWX (910) 595-1130 • FAX # (714) 549-2858-5-2407

USP-39A Resin Lot for NASA Lot# 4

11. pH, units
CTM-1B

	#4-1	#4-2
	8.18	8.20
Lot# 4	AVERAGE	8.19

12. Phenol Content, %
CTM-55 Appendix 1

	12.83	12.93
	12.55	12.84
AVG.	12.69	12.88
Lot# 4	AVERAGE	12.79

13. Chang's Index, ml.
CTM-5B

	24.9	24.6
Lot# 4	AVERAGE	24.8

14. RDS, Minimum Viscosity, cps.
CTM-57A

	Min. Visc.	•C
#4-1	148	106
#4-2	143	106
AVG.	145	106

See Charts 14A-14B

15. NMR
Vendor procedure

See Charts 15A-15B

U. S. Polymeric

Hamid M. Quraishi

Hamid M. Quraishi, Manager
Quality Assurance Department

TYPICAL GAS CHROMATOGRAPH SET-UP

Operator	D.D.Z.	Date	12/16/86
Column		Detector	FID
Length	6 Ft.	Voltage	
Dia.	1/8 in.	Sensit.	
Liquid Phase	AT-1000	Flow Rates, ml/min	
Wt. %	0.1	Hydrogen	60 Air 296
Support	GRAPHPAC	Scavenge	
Mesh	80/100	Split	
Carrier Gas	He.	Temperature, °C	
Rotameter		Det.	220 Inj. 200
Inlet Press	60 psig	Column Initial	60
Rate	30 ml/min	Final	210
CHART SPEED		Rate	5°C/MIN
SAMPLE	USP39A,4-1	Solvent	THF
Size	0.05 ul	Concn.	0.1631 gm/ml

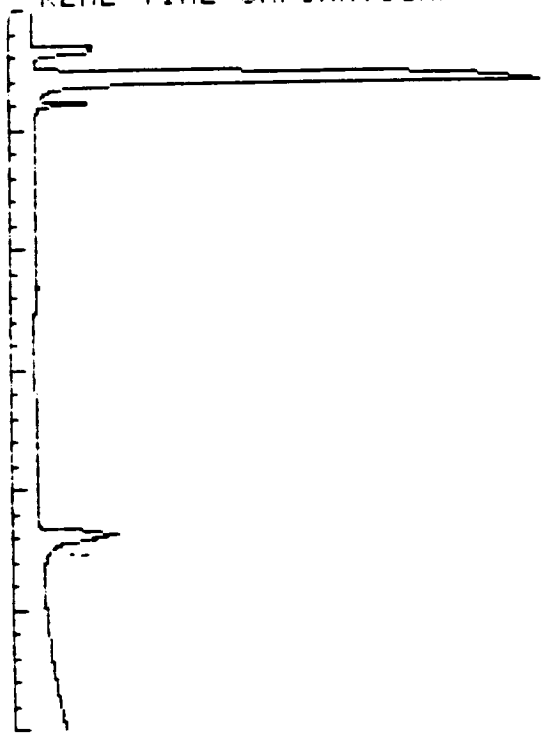
GAS CHROMATOGRAPHY STANDARD SOLVENT

TEST METHOD CTM-55

STANDARD SOLVENT/MONOMER	RETENTION TIME (MINS.)
MEOH	.6
ETHANOL	1.18
MECL2	1.28
ACETONE	1.45
IPA	1.83
THF	3.08
ACETONITRILE	3.2
CRESOL	4.03
MEK	4.08
FURFURAL	15.03
TOLUENE	17.98
CHLOROBENZENE	19.6
PHENOL	22.08

NOTE: THF WAS USED TO DILUTE THE RESIN SAMPLES.

REAL TIME CHROMATOGRAM ***



FINAL FULL SCALE MV =1000.00

SAMPLE: USP39A 4-1
MISC.: C=0.11631 GMS/ML

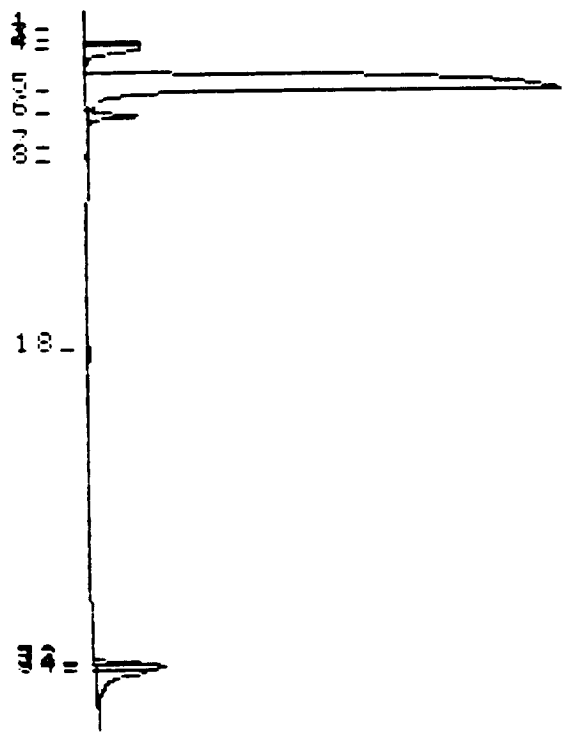
TIME: 12:34
DATE: 12/16/86
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES
DELAY TIME: 0.00
CHAN: 0

PK NO	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
1	.67	1162	.029	1	191
3	1.60	76625	1.922	2	11349
4	1.80	191960	4.815	2	11360
5	3.20	3116800	78.236	2	97574
6	3.98	136680	3.429	3	10372
7	5.03	3086	.077	4	153
8	5.50	3265	.082	2	326
18	11.63	13890	.348	2	675
32	21.78	54611	1.370	2	10649
33	21.90	178710	4.483	2	14799
34	22.10	207590	5.207	2	10581

TOTAL AREA= 3986379
THRESHOLD= 1
MIN.PK.WIDTH= 15
AREA REJECT= 1000

VERTICAL SCALE FACTOR: 1X



SAMPLE: USP39A 4-1
MISC.: C=0.11631 GMS/ML

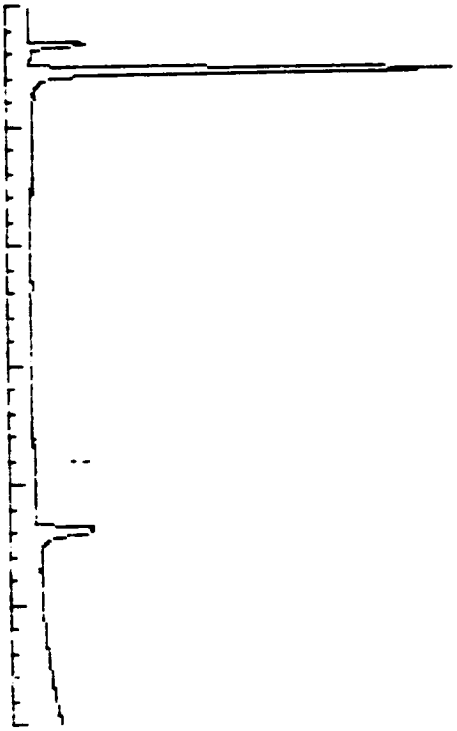
TIME: 12:34
DATE: 12/16/86
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES
DELAY TIME: 0.00
CHAN: 0

PK NO.	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
3	1.60	76625	1.933	2	11349
4	1.80	191960	4.841	2	11360
5	3.20	3118800	78.659	2	97574
6	3.98	136680	3.447	3	10372
32	21.78	54611	1.377	2	10649
33	21.90	178710	4.507	2	14799
34	22.10	207590	5.236	2	10581

TOTAL AREA= 3964976
THRESHOLD= 1
MIN PK.WIDTH= 15
AREA REJECT= 15000

*** REAL TIME CHROMATOGRAM ***



FINAL FULL SCALE MV.=1000.00

SAMPLE: USP39A 4-2
MISC.: C=0.10199 GMS/ML

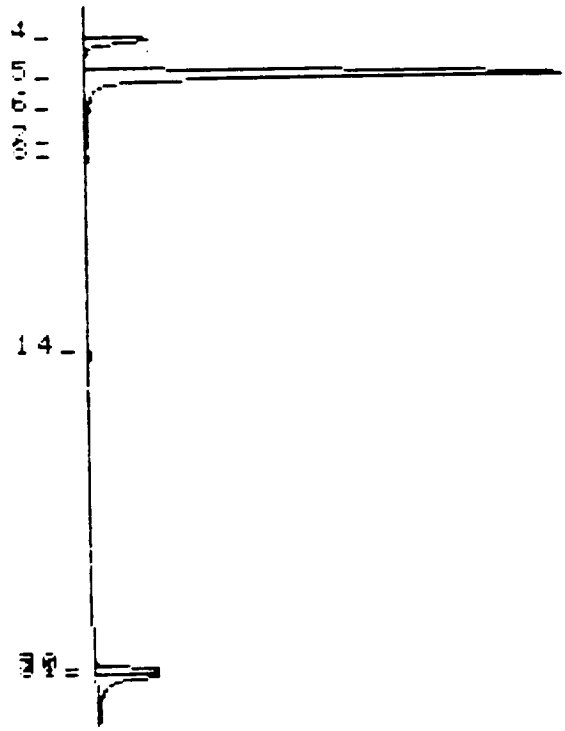
TIME: 14:04
DATE: 12/16/86
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES
DELAY TIME: 0.00
CHAN: 0

PK NO	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
4	1.65	139370	7.563	2	10853
5	2.90	1343400	72.896	3	81323
6	3.88	16833	.913	4	843
7	4.99	2075	.113	4	123
8	5.48	2769	.150	3	235
14	11.65	9910	.538	1	512
30	21.85	121440	6.590	2	10620
31	22.03	207110	11.238	2	10643

TOTAL AREA= 1842907
THRESHOLD= 1
MIN.PK.WIDTH= 15
AREA REJECT= 1000

VERTICAL SCALE FACTOR: 1X



SAMPLE: USP39A 4-2
MISC.: C=0.10199 GMS/ML

TIME: 14:04
DATE: 12/16/86
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES
DELAY TIME: 0.00
CHAN: 0

PK NO.	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
4	1.65	139370	7.694	2	10853
5	2.90	1343400	74.167	3	81323
30	21.85	121440	6.705	2	10620
31	22.03	207110	11.434	2	10643

TOTAL AREA= 1811320
THRESHOLD= 1
MIN PK WIDTH= 15
AREA REJECT= 17000

Figure #6

Sample: SUP39A71108 4-1
Size: 19.594 mg
Run No: MIR #13079 (I2)
Date: MAY/21/86 14:16

TGA

OMNITHERM DATA SYSTEM
BECKMAN INDUSTRIAL

Operator: M. WEGENER
Disk ID: DATA DISK #107
File No: D 37.DAT V2.1
Plotted: MAY/22/86 08:15

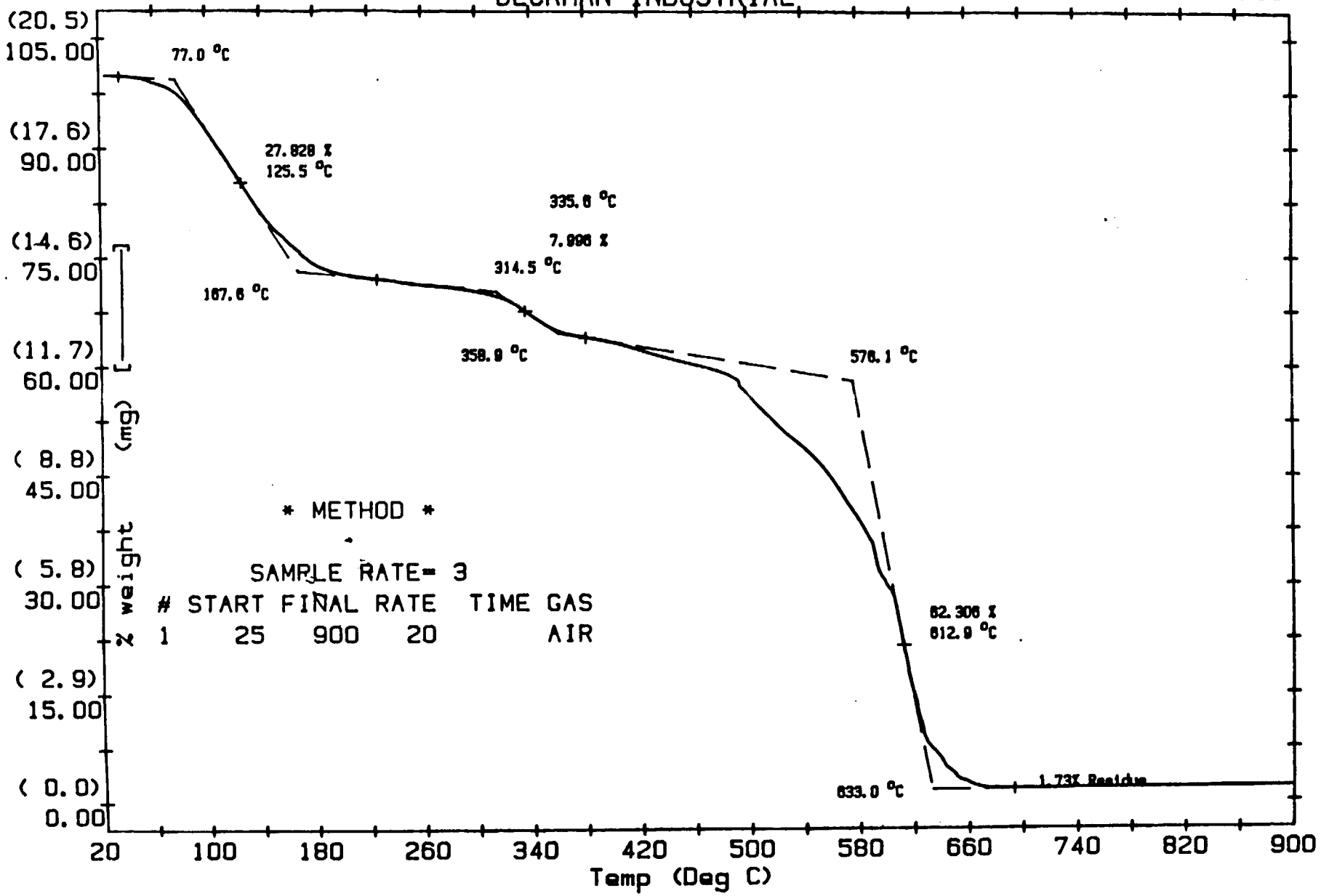


CHART 7A

Beckman Industrial™ ANALYTICAL LABORATORY SERVICES

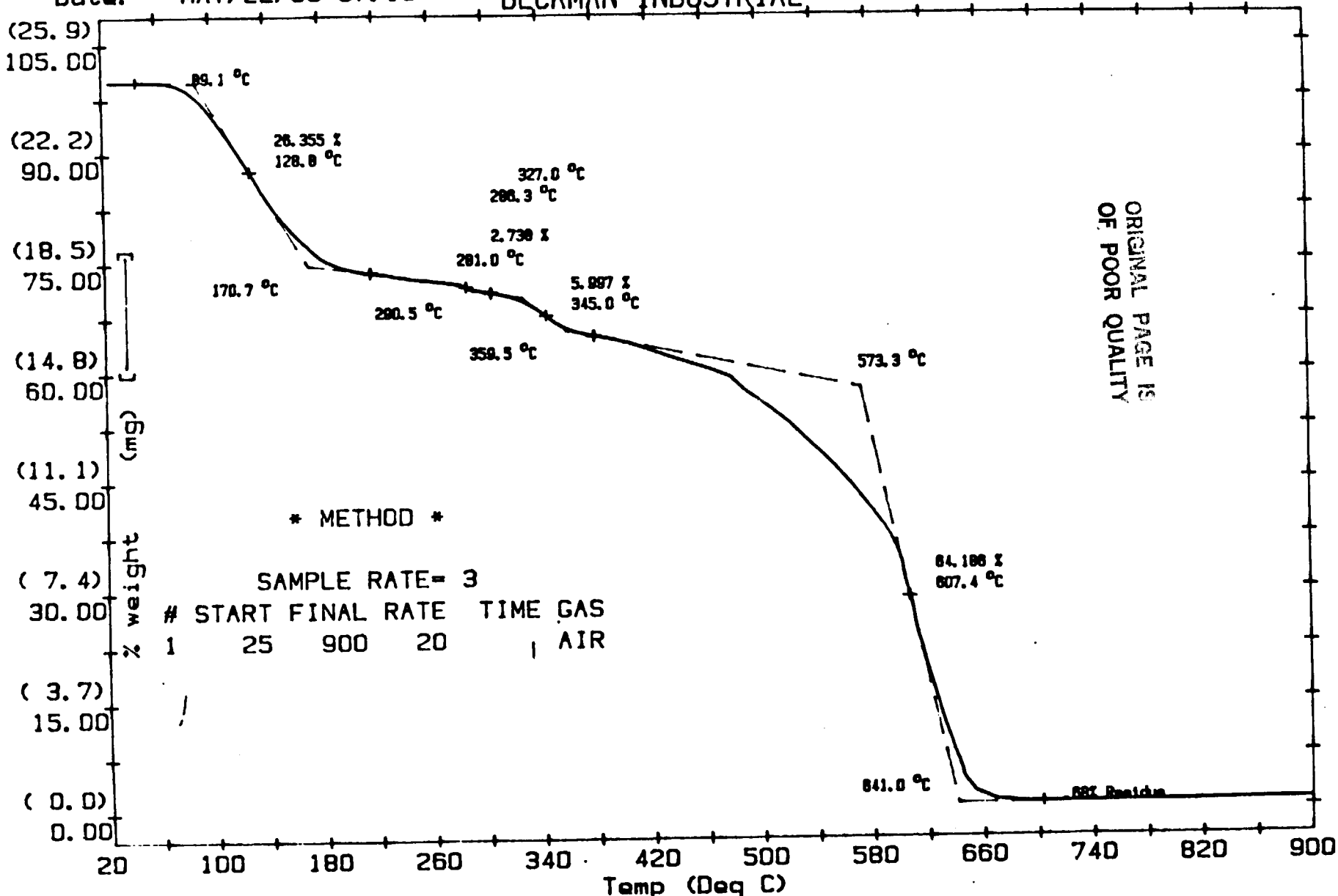
Figure 1

Sample: USP39A71108 4-2
Size: 24.694 mg
Run No: MIR #13080 (12)
Date: MAY/22/86 07:18

TGA

OMNITHERM DATA SYSTEM
BECKMAN INDUSTRIAL

Operator: M. WEGENER
Disk ID: DATA DISK #107
File No: D 46.DAT V2.1
Plotted: MAY/27/86 08:01



* METHOD *

SAMPLE RATE= 3

#	START	FINAL	RATE	TIME	GAS
1	25	900	20		AIR

CHART 7B

PART NO. 990088

ORIGINAL PAGE IS OF POOR QUALITY

CHART 8A

RUN NO ___ DATE 2-23-87

OPERATOR ak

SAMPLE: 4-1 USP 39A

ATM N_2 @ 1 atm

FLOW RATE 40 ml/min

T-AXIS

SCALE, °C/in 50

PROG. RATE, °C/min 20°

HEAT ✓ COOL ___ ISO ___

SHIFT, in 0

DTA-DSC

SCALE, °C/in 1.0/5X

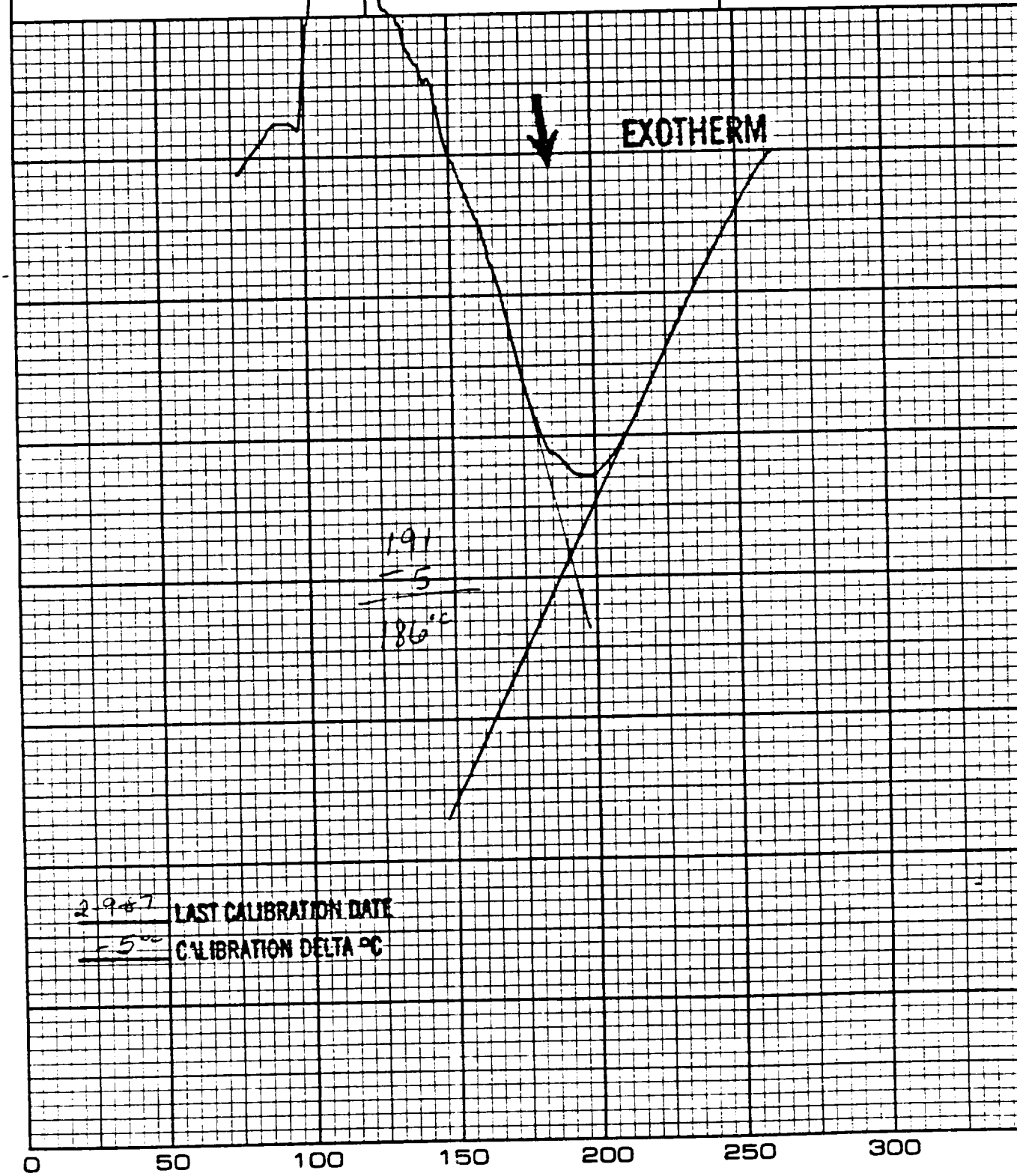
(mcal/sec)/in ___

WEIGHT, mg 3.2

REFERENCE 1 alum seal

DU PONT Instruments

MEASURED VARIABLE ___



2-9-87 LAST CALIBRATION DATE

-5° CALIBRATION DELTA °C

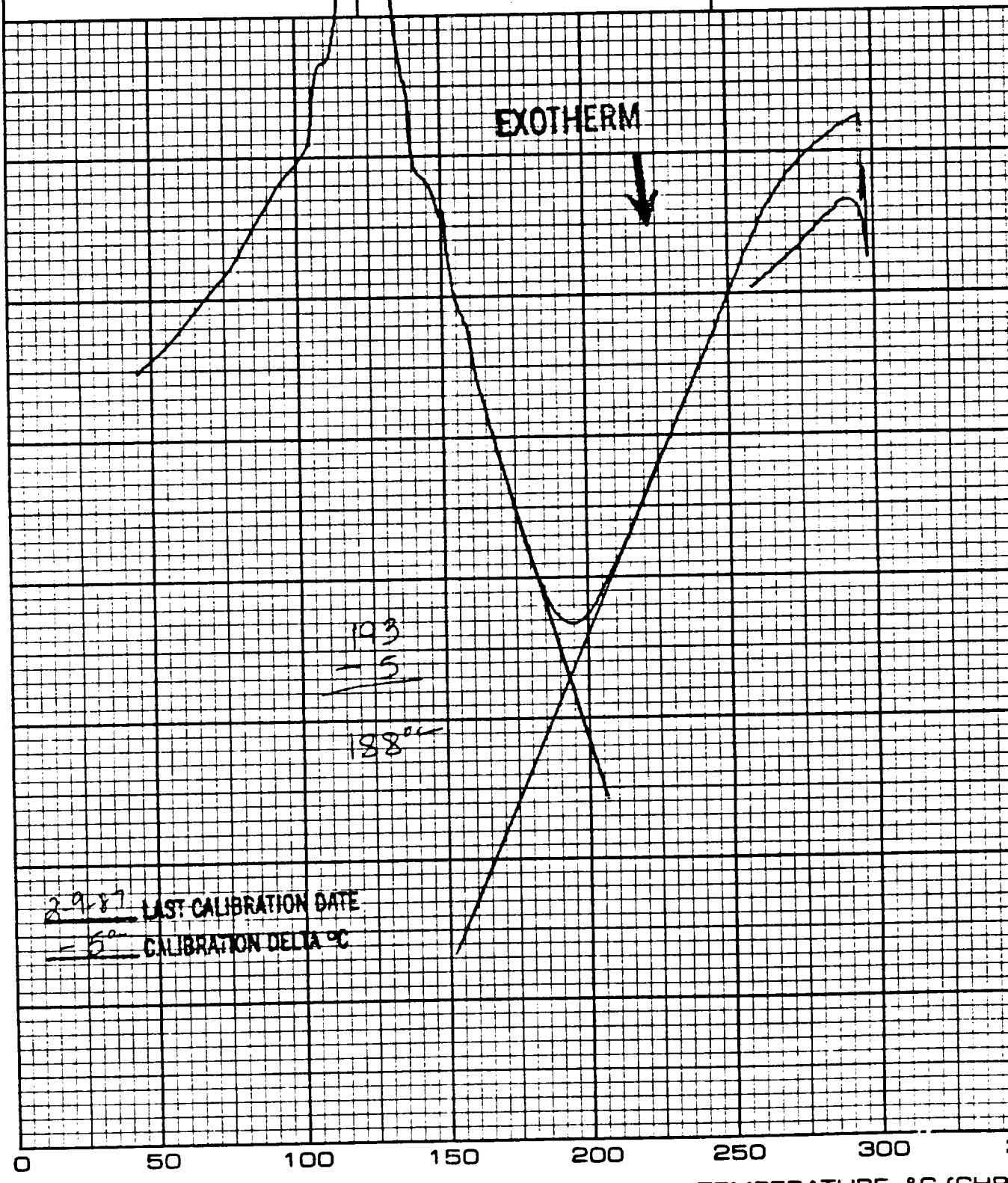
PART NO. 990088

DU PONT Instruments

RUN NO. ___ DATE 2-23-87
OPERATOR gek
SAMPLE: USP 39A 4-2
ATM N2 @ 1atm
FLOW RATE 40 ml/min

T-AXIS
SCALE, °C/in 50
PROG. RATE, °C/min 20°
HEAT ✓ COOL ___ ISO ___
SHIFT, in 0

DTA-DSC
SCALE, °C/in 1.0 /Sx
(mcal/sec)/in ___
WEIGHT, mg 3.9
REFERENCE Talum seal



MEASURED VARIABLE ___

CHART 9A

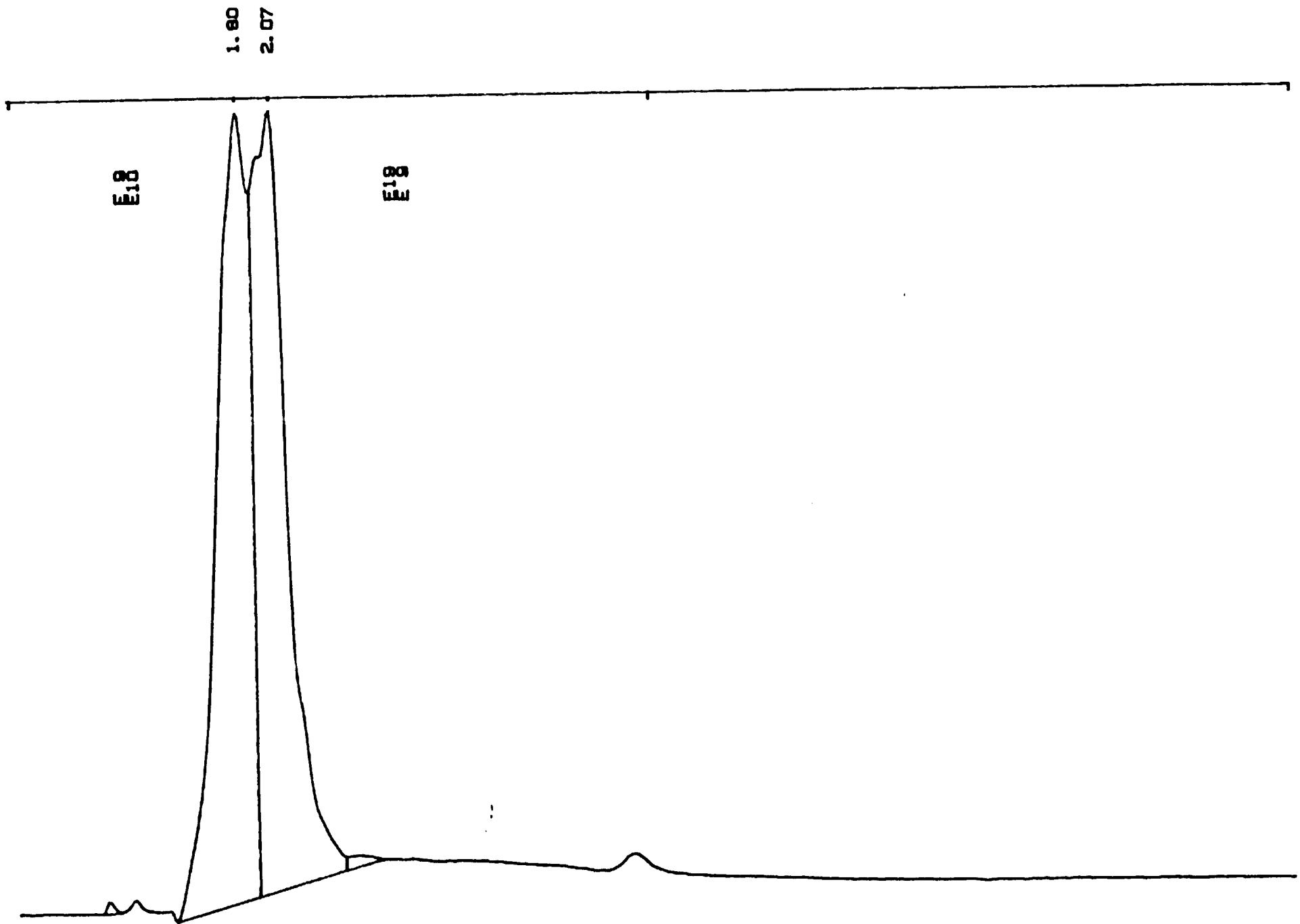
******** AREA PERCENT REPORT ********

Sample Name: USP39A,4-1,C=6.67 Operator Initials: JGZ
Date: 09-05-1986 12:02:14 Method:PHENOLIC DATA FILE: A:PHENO29.PTS
Interface: 4 Cycle#: 29 Channel#: 0 Vial#: N.A.
Starting Peak Width: 10 Threshold: .01
Instrument Type: BECKMAN HPLC Column Type: MICROBONDAPAK C-18
Solvent Description: THF/WATER, 2:1 BY WEIGHT
Operating Conditions: R.T., FLOWRATE=1.5 ML/MIN
Detector 0: 220NM/.5AU Detector 1:
Misc. Information: LENGTH=25
Starting Delay: 0.00 Ending Retention Time: 10.00

Pk No.	Ret. Time	Peak Area	Area %	B L	Peak Ht.	Normalized %	Area/ Height
2	1.80	89195	51.2031	2	4841	100.000	18.4
3	2.07	85003	48.7969	2	4793	95.301	17.7

Total Area: 174198 Area Reject: 1000 One sample per 1.000 sec.

DATA FILE=PHEN028 FROM 0.00 MIN. TO 10.00 MIN. LOW SCALE= 5.416 Mv. HIGH SCALE= 10.388 Mv.
USP-38A, 4-1, C=6.67 MG/ML, 9/5/86, JGZ



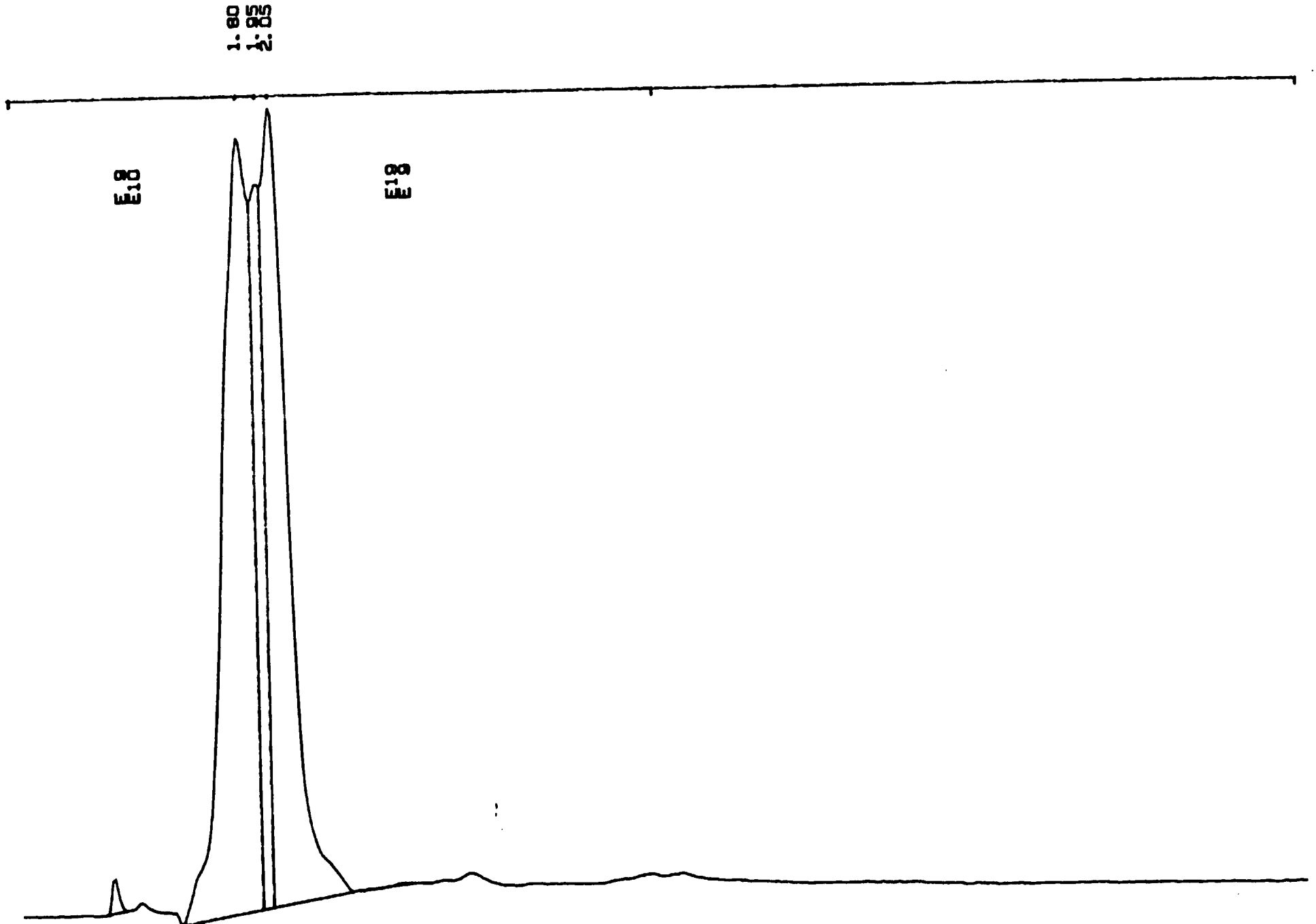
******** AREA PERCENT REPORT ********

Sample Name: USP39A,4-2,C=4.96 Operator Initials: JGZ
Date: 09-01-1986 15:58:03 Method:PHENOLIC DATA FILE: A:PHEN021.PTS
Interface: 4 Cycle#: 21 Channel#: 0 Vial#: N.A.
Starting Peak Width: 10 Threshold: .01
Instrument Type: BECKMAN HPLC Column Type: MICROBONDAPAK C-18
Solvent Description: THF/WATER, 2:1 BY WEIGHT
Operating Conditions: R.T., FLOWRATE=1.5 ML/MIN
Detector 0: 220NM/.5AU Detector 1:
Misc. Information: LENGTH=25
Starting Delay: 0.00 Ending Retention Time: 10.00

Peak No.	Ret Time	Peak Area	Area %	B L	Peak Ht.	Normalized %	Area/ Height
2	1.80	81017	49.7413	2	4923	100.000	16.5
3	1.95	22173	13.6137	2	4605	27.369	4.8
4	2.05	59686	36.6450	2	5071	73.671	11.8

Total Area: 162876 Area Reject: 1000 One sample per 1.000 sec.

DATA FILE=PHEN021 FROM 0.00 MIN. TO 10.00 MIN. LOW SCALE= 5.445 Mv. HIGH SCALE= 10.636 Mv.
USP-38A, 4-2, C=4.98 MG/ML, 9/2/86, JGZ



*** Calibration Data ***
Calibration Name:
Misc Information:

Fit Type: 3
Log Mol Wt = A + Bx + Cx^2 + Dx^3
A= 2.538977 B= 2.115815 C= -.5646824 D= 3.606432E-02
Coefficient of Determination: 0.9902

Ret Time	Molecular Weight	Log Mol Wt
3.50	35000	4.544
4.33	15000	4.176
4.83	3600	3.556
5.09	2350	3.371
6.00	570	2.756
7.17	92	1.964
7.50	72	1.857

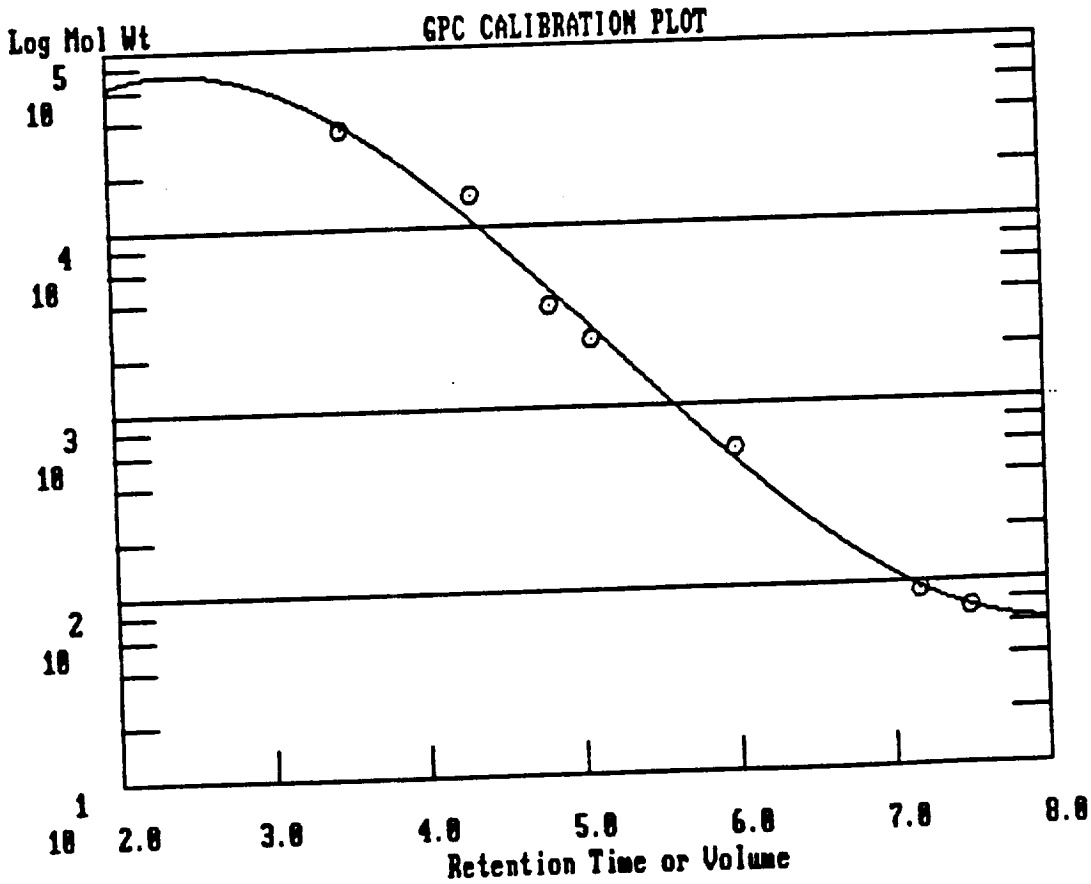
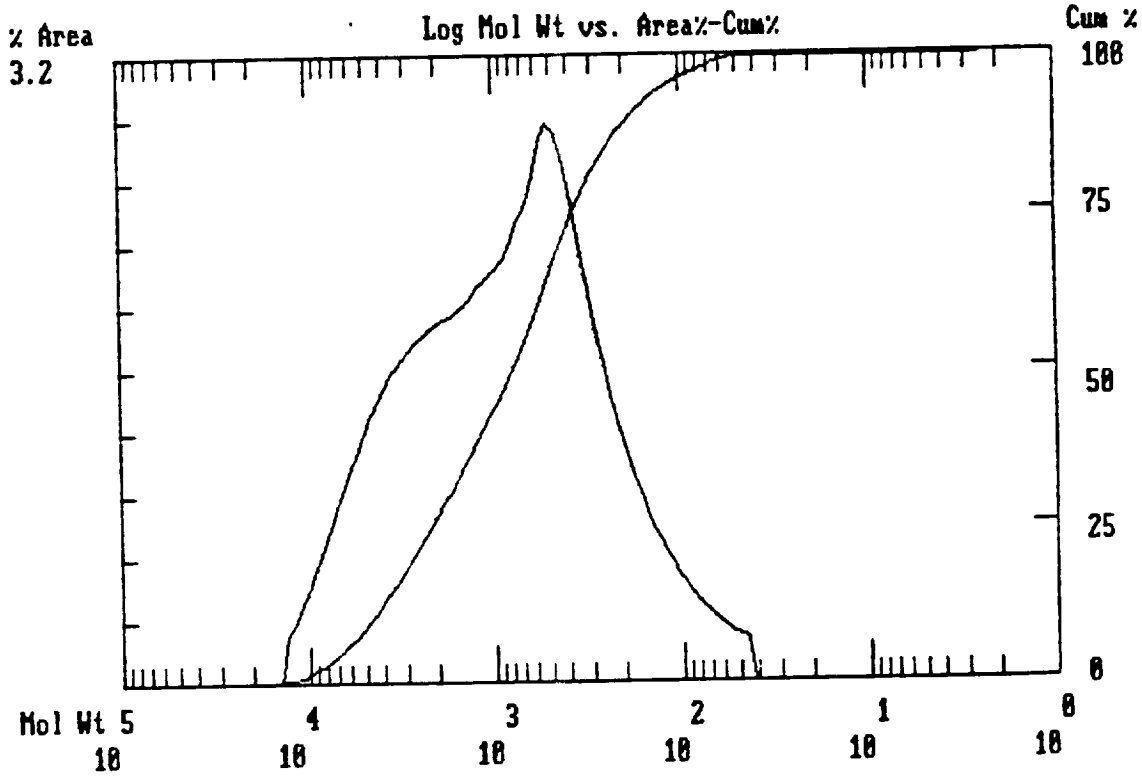


CHART 10A

'A FILE A:GPC36.HDR TAKEN 08-05-1986 17:56:32

********* GPC REPORT *********

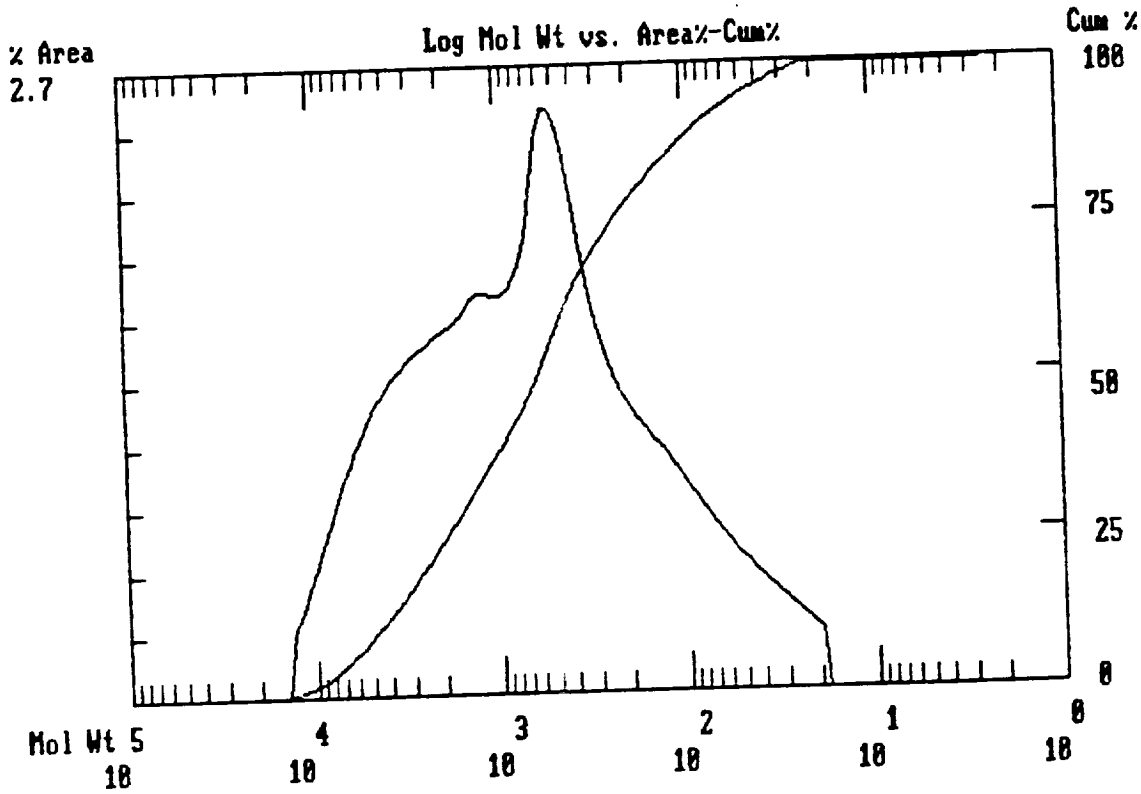
```
* ************************************************************************************
* Sample Name: USP39A 4-1=2.68                    Operator Initials: GBF          *
* Date:  08-05-1986 16:34:28 Method:              DATA FILE: A:GPC36.PTS          *
* Interface: 5                Cycle#:  36         Channel#: 0    Vial#: N.A.      *
* Starting Peak Width:  60    Threshold:  0                                       *
************************************************************************************
*  Instrument Type: HPLC/BECKMAN              Column Type: ULTRASTYRAGEL 500A     *
*              Solvent Description: THF                                           *
*   Operating Conditions: T=35C FLOWRATE=2.0ML/MIN                                *
*            Detector 0: 254NM/.1AU            Detector 1:                        *
*     Misc. Information: CALIBRATION/GPC                                         *
************************************************************************************
S arting Delay:    0.00                         Ending Retention Time:    10.00
C libration file: GPCPHEN
Molecular Weight Distribution Averages
Baseline TIMES:    3.85 to   10.00   MW:      22295 to          2
F ocess -IMES:     3.85 to   10.00   MW:      22295 to          2
T tal Area:       229203
Mw=                 1679
M =                  422
M /Mn=            3.9799
Mz=                 4462
  =                 1459
```

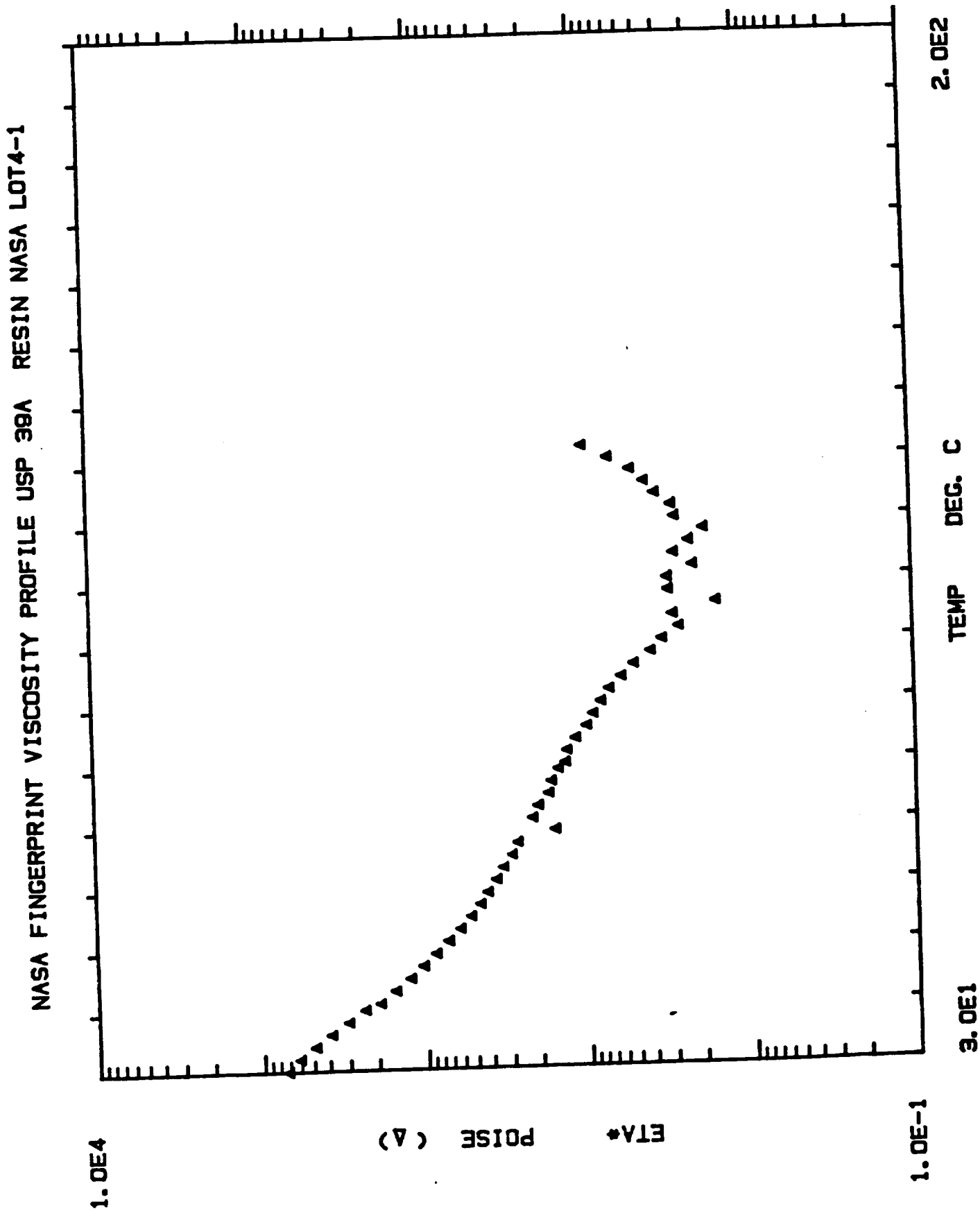


DATA FILE A:GPC37.HDR TAKEN 08-05-1986 17:59:34

******** GPC REPORT ********

```
**********************************************************************
* Sample Name: USP39A 4-2=2.68          Operator Initials: GBF       *
* Date:  08-05-1986 16:46:38 Method:    DATA FILE: A:GPC37.PTS       *
* Interface: 5               Cycle#:  37 Channel#: 0   Vial#: N.A.   *
* Starting Peak Width:  60   Threshold:  0                            *
**********************************************************************
*  Instrument Type: HPLC/BECKMAN          Column Type: ULTRASTYRAGEL 500A *
*            Solvent Description: THF                                *
*   Operating Conditions: T=35C FLOWRATE=2.0ML/MIN                   *
*           Detector 0: 254NM/.1AU          Detector 1:              *
*     Misc. Information: CALIBRATION/GPC                             *
**********************************************************************
Starting Delay:    0.00                 Ending Retention Time:   10.00
Calibration file: GPCPHEN
Molecular Weight Distribution Averages
Baseline TIMES:    3.85 to   10.00   MW:    22295 to        2
Process TIMES:     3.85 to   10.00   MW:    22295 to        2
Total Area:      192576
Mw=                1577
Mn=                 217
Mw/Mn=           7.2524
Mz=                4789
                   1326
```




NASA FINGERPRINT VISCOSITY PROFILE USP 38A RESIN NASA LOT4-1
ETA* POISE (A)
1.0E4
1.0E-1
TEMP DEG. C
2.0E2
3.0E1

Rheometrics RECAP II

Experiment No. : 5 Sample No. : 1

Title:
A 9 FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT4-1

Operator :cp

Date and Time : Monday, August 18, 1986 - 10:37:58

Operating Mode : DYNAMIC

Sweep Type : CURE

Geometry : DISK & PLATE
RADIUS : 25.00
GAP : 0.50

Notes :
[illegible] 9IN =50%
[illegible]QUENCY =10 RAD/SEC

NASA FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT4-1

NO.	ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
1	7.356e+002	7.347e+002	3.604e+001	9.281e+001	2.000e-001	2.900e+001
2	6.972e+002	6.962e+002	3.653e+001	8.900e+001	1.000e+000	3.000e+001
3	5.909e+002	5.901e+002	3.035e+001	7.450e+001	2.000e+000	3.200e+001
4	4.739e+002	4.732e+002	2.555e+001	5.973e+001	3.000e+000	3.400e+001
5	3.764e+002	3.753e+002	2.849e+001	4.741e+001	4.000e+000	3.600e+001
6	2.946e+002	2.931e+002	2.905e+001	3.704e+001	5.000e+000	3.800e+001
7	2.327e+002	2.314e+002	2.503e+001	2.927e+001	6.000e+000	4.000e+001
8	1.876e+002	1.859e+002	2.533e+001	2.357e+001	7.000e+000	4.100e+001
9	1.507e+002	1.487e+002	2.445e+001	1.893e+001	8.000e+000	4.300e+001
10	1.215e+002	1.193e+002	2.343e+001	1.527e+001	9.000e+000	4.500e+001
11	1.010e+002	9.834e+001	2.309e+001	1.268e+001	1.000e+001	4.700e+001
12	8.408e+001	8.084e+001	2.311e+001	1.053e+001	1.100e+001	4.900e+001
13	7.028e+001	6.723e+001	2.049e+001	8.813e+000	1.200e+001	5.100e+001
14	5.958e+001	5.642e+001	1.915e+001	7.477e+000	1.300e+001	5.300e+001
15	5.106e+001	4.824e+001	1.673e+001	6.413e+000	1.400e+001	5.500e+001
16	4.459e+001	4.208e+001	1.475e+001	5.599e+000	1.500e+001	5.700e+001
17	4.010e+001	3.795e+001	1.295e+001	5.030e+000	1.600e+001	5.900e+001
18	3.536e+001	3.360e+001	1.100e+001	4.437e+000	1.700e+001	6.100e+001
19	3.190e+001	3.052e+001	9.294e+000	3.999e+000	1.800e+001	6.300e+001
20	2.823e+001	2.706e+001	8.066e+000	3.540e+000	1.900e+001	6.500e+001
21	2.593e+001	2.497e+001	6.980e+000	3.254e+000	2.000e+001	6.700e+001
22	1.51ee+001	1.340e+001	7.078e+000	1.902e+000	2.100e+001	6.900e+001
23	2.092e+001	2.021e+001	5.397e+000	2.625e+000	2.200e+001	7.100e+001
24	1.918e+001	1.861e+001	4.625e+000	2.406e+000	2.300e+001	7.300e+001
25	1.646e+001	1.596e+001	4.031e+000	2.066e+000	2.400e+001	7.500e+001
26	1.582e+001	1.536e+001	3.810e+000	1.985e+000	2.500e+001	7.700e+001
27	1.428e+001	1.386e+001	3.450e+000	1.792e+000	2.600e+001	7.900e+001
28	1.286e+001	1.247e+001	3.145e+000	1.612e+000	2.700e+001	8.000e+001
29	1.250e+001	1.219e+001	2.770e+000	1.569e+000	2.800e+001	8.200e+001
30	1.103e+001	1.065e+001	2.864e+000	1.385e+000	2.900e+001	8.400e+001
31	9.406e+000	9.166e+000	2.113e+000	1.180e+000	3.000e+001	8.600e+001
32	8.563e+000	8.359e+000	1.860e+000	1.075e+000	3.100e+001	8.800e+001
33	7.639e+000	7.351e+000	2.078e+000	9.584e-001	3.200e+001	9.000e+001
34	6.765e+000	6.563e+000	1.644e+000	8.495e-001	3.300e+001	9.200e+001
35	5.684e+000	5.498e+000	1.444e+000	7.128e-001	3.400e+001	9.400e+001
36	4.764e+000	4.696e+000	8.022e-001	5.979e-001	3.500e+001	9.600e+001
37	3.731e+000	2.963e+000	2.268e+000	4.681e-001	3.600e+001	9.800e+001
38	3.183e+000	3.105e+000	6.963e-001	3.995e-001	3.700e+001	1.000e+002
39	2.505e+000	2.229e+000	1.147e+000	3.142e-001	3.800e+001	1.020e+002
40	2.716e+000	2.646e+000	6.147e-001	3.410e-001	3.900e+001	1.040e+002
41	1.481e+000	1.330e+000	6.518e-001	1.860e-001	4.000e+001	1.060e+002
42	2.581e+000	2.760e+000	8.249e-001	3.617e-001	4.100e+001	1.080e+002
43	2.905e+000	2.869e+000	4.572e-001	3.646e-001	4.200e+001	1.100e+002
44	2.030e+000	1.850e+000	8.377e-001	2.546e-001	4.300e+001	1.120e+002
45	2.647e+000	2.470e+000	9.504e-001	3.320e-001	4.400e+001	1.140e+002
46	2.124e+000	1.852e+000	1.040e+000	2.663e-001	4.500e+001	1.160e+002
47	1.720e+000	1.529e+000	7.970e-001	2.164e-001	4.600e+001	1.180e+002
48	2.573e+000	2.367e+000	1.219e+000	3.231e-001	4.700e+001	1.200e+002
49	2.491e+000	2.318e+000	1.368e+000	3.377e-001	4.800e+001	1.220e+002
50	3.057e+000	2.814e+000	1.849e+000	4.228e-001	4.900e+001	1.240e+002

NASA FINGERPRINT VISCOSITY PROFILE USP 39A RESIN NASA LOT4-1

NO.	ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
1	3.894e+000	3.271e+000	2.112e+000	4.887e-001	5.000e+001	1.260e+002
52	4.707e+000	3.972e+000	2.525e+000	5.911e-001	5.100e+001	1.290e+002
53	6.426e+000	5.930e+000	2.477e+000	8.062e-001	5.200e+001	1.300e+002
4	9.204e+000	8.352e+000	3.868e+000	1.156e+000	5.300e+001	1.320e+002

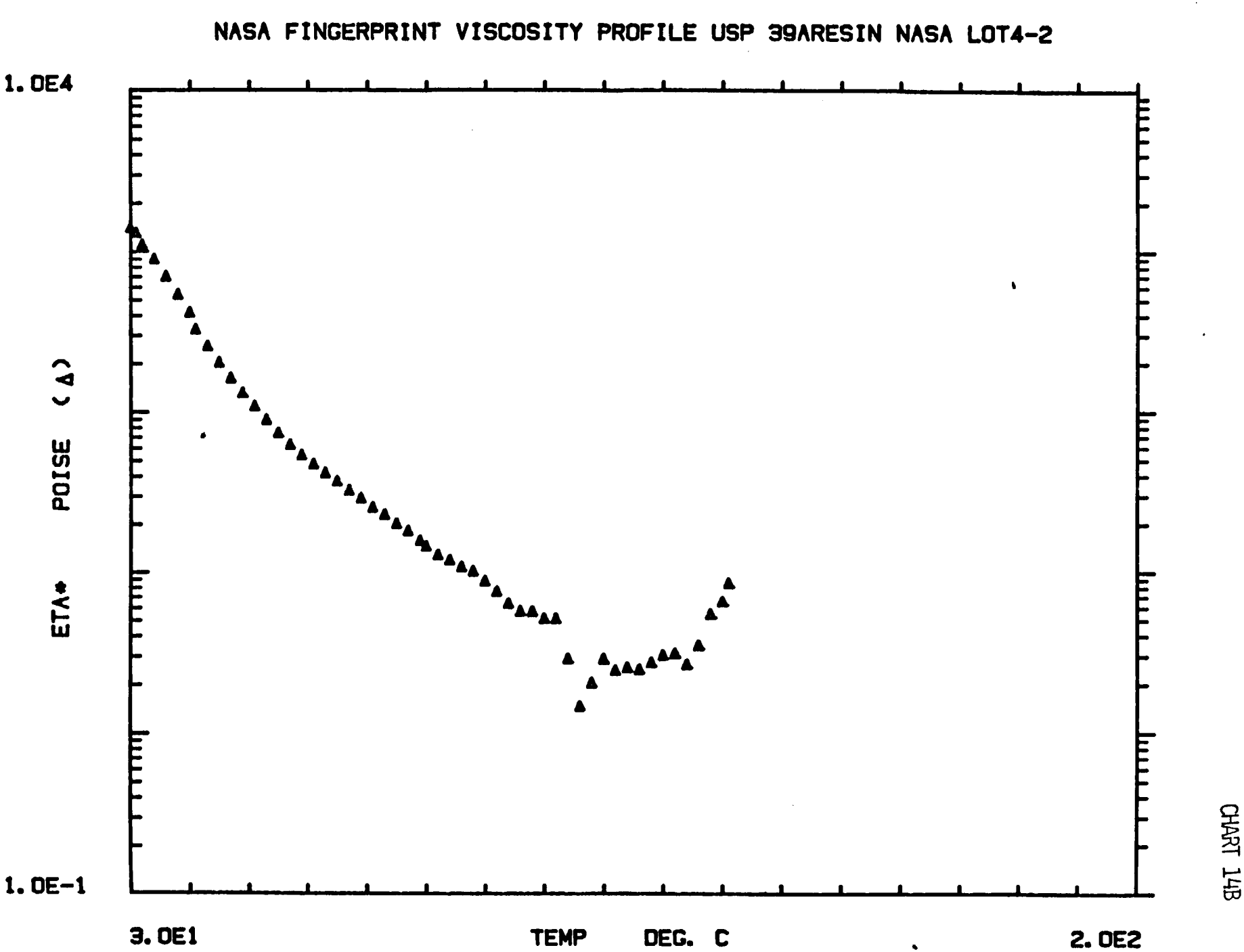

NASA FINGERPRINT VISCOSITY PROFILE USP 39ARESIN NASA LOT4-2
1.0E4
1.0E-1
ETA* POISE (Δ)
3.0E1
TEMP DEG. C
2.0E2

CHART 14B

Rheometrics RECAP II

Experiment No. : 6 Sample No. : 1

Title:
NASA FINGERPRINT VISCOSITY PROFILE USP 39ARESIN NASA LOT4-2

Operator :CP

Date and Time : Monday, August 18, 1986 - 12:16:30

Operating Mode : DYNAMIC

Sweep Type : CURE

Geometry : DISK & PLATE
RADIUS : 25.00
GAP : 0.50

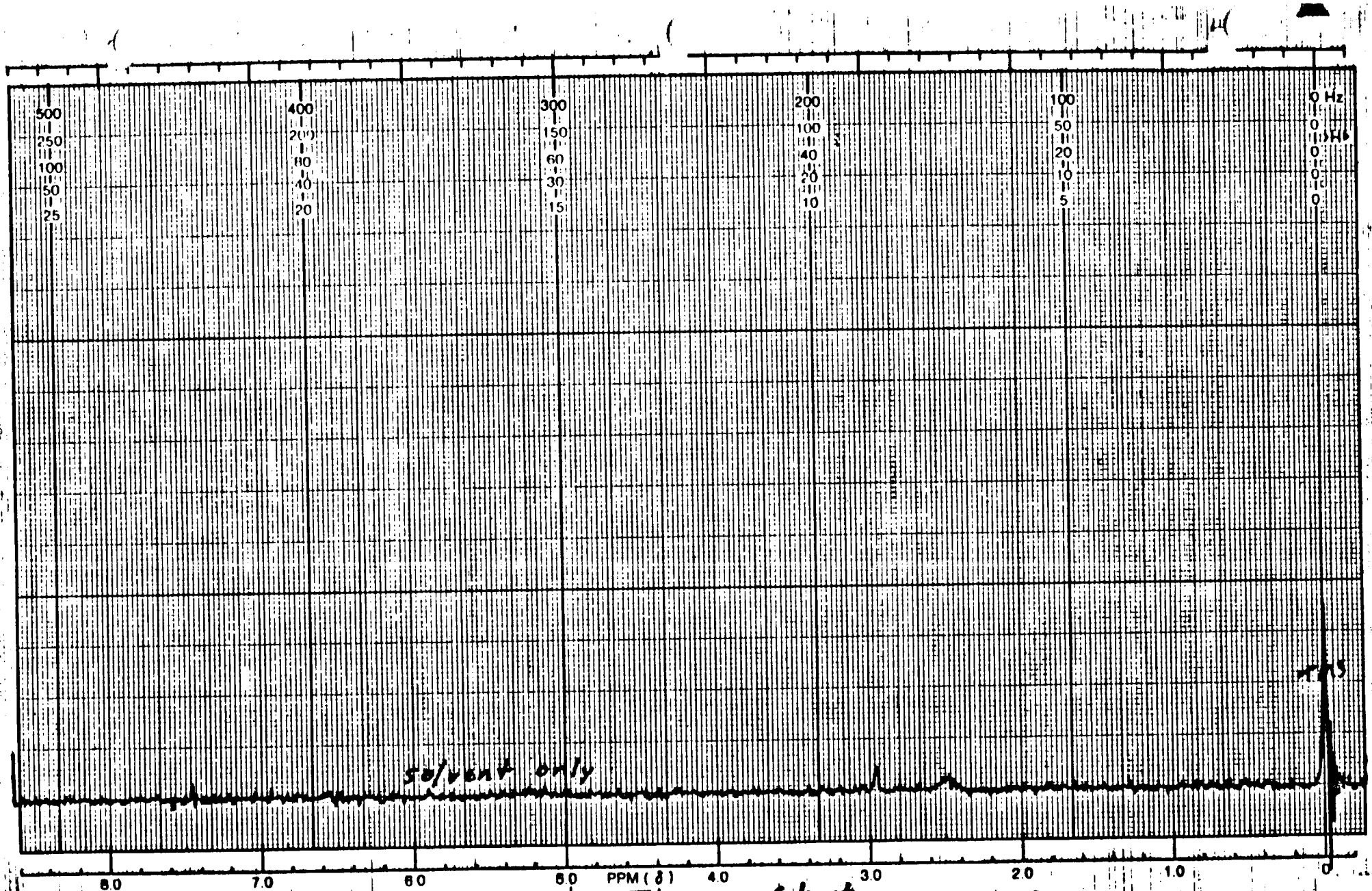
Notes :
STRAIN =50%
FREQUENCY =10 RAD/SEC

NASA FINGERPRINT VISCOSITY PROFILE USP 39ARESIN NASA LOT4-2

NO.	ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
1	1.376e+003	1.376e+003	4.762e+001	1.742e+002	2.000e-001	3.000e+001
2	1.278e+003	1.278e+003	4.150e+001	1.617e+002	1.000e+000	3.100e+001
3	1.080e+003	1.080e+003	3.796e+001	1.365e+002	2.000e+000	3.200e+001
4	8.738e+002	8.731e+002	3.545e+001	1.104e+002	3.000e+000	3.400e+001
5	6.808e+002	6.801e+002	3.189e+001	8.591e+001	4.000e+000	3.600e+001
6	5.270e+002	5.263e+002	2.742e+001	6.640e+001	5.000e+000	3.800e+001
7	4.063e+002	4.055e+002	2.577e+001	5.112e+001	6.000e+000	4.000e+001
8	3.184e+002	3.173e+002	2.591e+001	4.002e+001	7.000e+000	4.100e+001
9	2.503e+002	2.490e+002	2.551e+001	3.146e+001	8.000e+000	4.300e+001
10	1.979e+002	1.963e+002	2.496e+001	2.488e+001	9.000e+000	4.500e+001
11	1.583e+002	1.568e+002	2.356e+001	1.988e+001	1.000e+001	4.700e+001
12	1.275e+002	1.257e+002	2.335e+001	1.602e+001	1.100e+001	4.900e+001
13	1.055e+002	1.038e+002	2.283e+001	1.325e+001	1.200e+001	5.100e+001
14	8.678e+001	8.484e+001	2.163e+001	1.089e+001	1.300e+001	5.300e+001
15	7.319e+001	6.930e+001	2.022e+001	9.055e+000	1.400e+001	5.500e+001
16	6.079e+001	5.825e+001	1.737e+001	7.630e+000	1.500e+001	5.700e+001
17	5.253e+001	5.019e+001	1.553e+001	6.596e+000	1.600e+001	5.900e+001
18	4.614e+001	4.405e+001	1.374e+001	5.792e+000	1.700e+001	6.100e+001
19	4.050e+001	3.872e+001	1.186e+001	5.084e+000	1.800e+001	6.300e+001
20	3.557e+001	3.452e+001	9.737e+000	4.501e+000	1.900e+001	6.500e+001
21	3.161e+001	3.043e+001	8.555e+000	3.968e+000	2.000e+001	6.700e+001
22	2.826e+001	2.730e+001	7.263e+000	3.544e+000	2.100e+001	6.900e+001
23	2.471e+001	2.393e+001	6.270e+000	3.106e+000	2.200e+001	7.100e+001
24	2.225e+001	2.159e+001	5.389e+000	2.791e+000	2.300e+001	7.300e+001
25	1.995e+001	1.898e+001	4.673e+000	2.455e+000	2.400e+001	7.500e+001
26	1.766e+001	1.711e+001	4.373e+000	2.216e+000	2.500e+001	7.700e+001
27	1.533e+001	1.497e+001	3.306e+000	1.934e+000	2.600e+001	7.900e+001
28	1.419e+001	1.375e+001	3.507e+000	1.781e+000	2.700e+001	8.000e+001
29	1.251e+001	1.205e+001	3.343e+000	1.570e+000	2.800e+001	8.200e+001
30	1.159e+001	1.127e+001	2.722e+000	1.454e+000	2.900e+001	8.400e+001
31	1.051e+001	1.023e+001	2.409e+000	1.318e+000	3.000e+001	8.600e+001
32	9.837e+000	9.514e+000	2.674e+000	1.240e+000	3.100e+001	8.800e+001
33	8.858e+000	8.597e+000	1.638e+000	1.073e+000	3.200e+001	9.000e+001
34	7.367e+000	7.234e+000	1.393e+000	9.245e-001	3.300e+001	9.200e+001
35	6.196e+000	6.091e+000	1.133e+000	7.771e-001	3.400e+001	9.400e+001
36	5.547e+000	5.406e+000	1.240e+000	6.961e-001	3.500e+001	9.600e+001
37	5.524e+000	5.374e+000	1.279e+000	6.927e-001	3.600e+001	9.800e+001
38	5.003e+000	4.947e+000	7.478e-001	6.278e-001	3.700e+001	1.000e+002
39	4.591e+000	4.856e+000	9.667e-001	6.258e-001	3.800e+001	1.020e+002
40	2.805e+000	2.645e+000	9.723e-001	3.519e-001	3.900e+001	1.040e+002
41	1.425e+000	1.229e+000	7.202e-001	1.788e-001	4.000e+001	1.060e+002
42	1.995e+000	1.774e+000	9.136e-001	2.504e-001	4.100e+001	1.080e+002
43	2.815e+000	2.740e+000	6.471e-001	3.534e-001	4.200e+001	1.100e+002
44	2.394e+000	2.342e+000	4.931e-001	3.003e-001	4.300e+001	1.120e+002
45	2.505e+000	2.454e+000	3.215e-001	3.146e-001	4.400e+001	1.140e+002
46	2.430e+000	2.340e+000	6.570e-001	3.049e-001	4.500e+001	1.160e+002
47	2.655e+000	2.495e+000	1.000e+000	3.374e-001	4.600e+001	1.180e+002
48	2.979e+000	2.814e+000	9.793e-001	3.741e-001	4.700e+001	1.200e+002
49	3.045e+000	2.971e+000	6.678e-001	3.820e-001	4.800e+001	1.220e+002
50	2.614e+000	2.449e+000	9.131e-001	3.281e-001	4.900e+001	1.240e+002

NASA FINGERPRINT VISCOSITY PROFILE USF 394RESIN NASA LOT4-2

NO.	ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
51	3.427e+000	3.307e+000	8.978e-001	4.300e-001	5.000e+001	1.260e+002
52	5.347e+000	5.018e+000	1.845e+000	6.710e-001	5.100e+001	1.290e+002
53	6.402e+000	6.055e+000	2.079e+000	8.032e-001	5.200e+001	1.300e+002
54	8.322e+000	7.985e+000	2.347e+000	1.045e+000	5.300e+001	1.310e+002



SWEEP OFFSET (Hz): 0
SPECTRUM AMPLITUDE: 8.0
INTEGRAL AMPLITUDE: —
SPINNING RATE (RPS): 30

MANUAL
SWEEP TIME (SEC): 30 250 500 1000
SWEEP WIDTH (Hz): 25 50 100 250 500
FILTER: 1 2 3 4 5 6 7 8
RF POWER LEVEL: 0.30

AUTO ☐
(250)
(500)
(2)
(.05)

SAMPLE: Solvent
SOLVENT: Uniol-d+0.82TMS
DEC. LEVEL

REMARKS:

ORIGINAL PAGE IS
OF POOR QUALITY

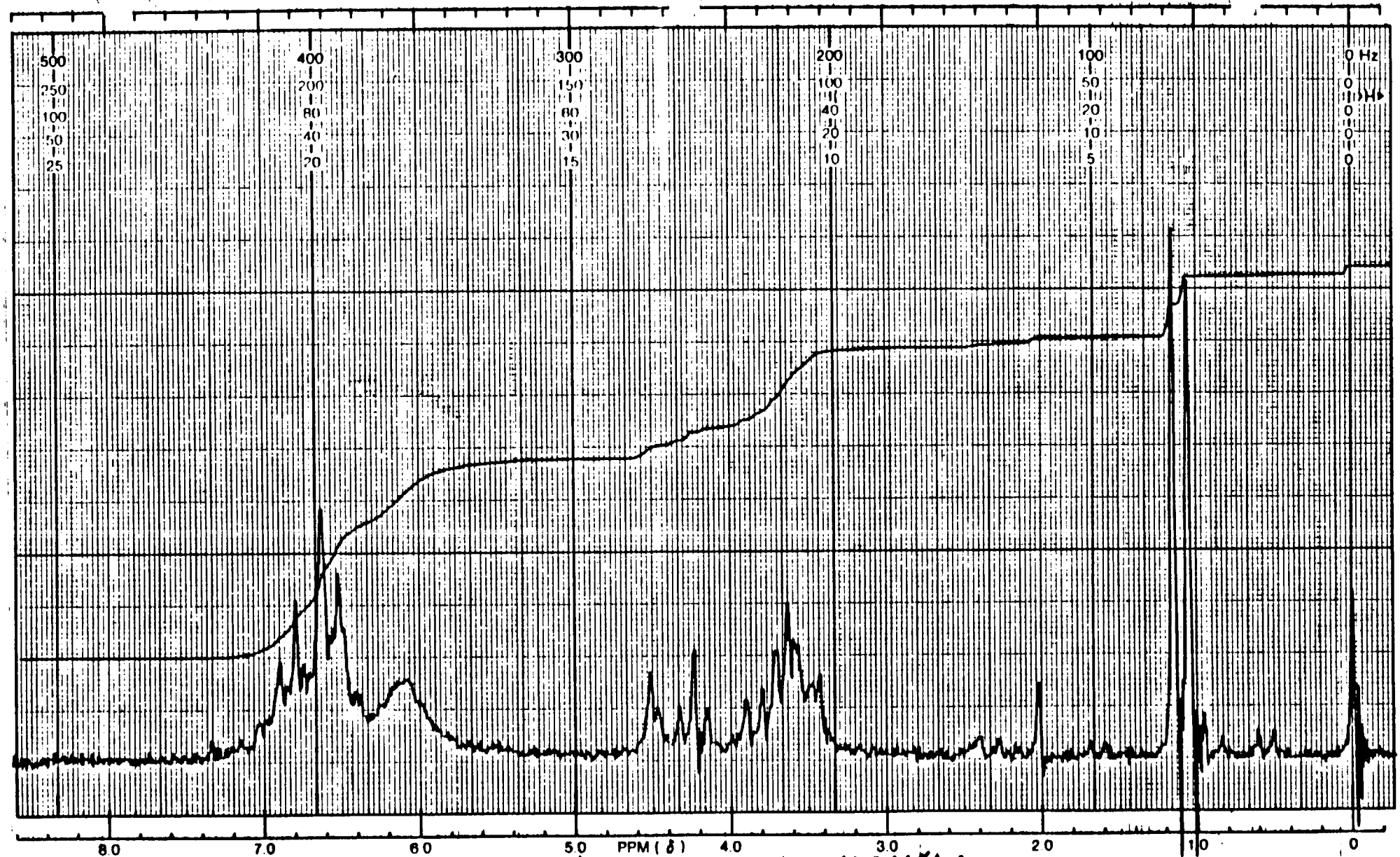
SOLVENT ONLY SCAN

NORELL, INC.
LANDISVILLE, N.J. 08326

DATE: 3-21-86

OPERATOR DEW

SPECTRUM NO. 1A of 7
solvent scan



SWEEP OFFSET (Hz): 0
SPECTRUM AMPLITUDE: 1.0
INTEGRAL AMPLITUDE: 6.0
SPINNING RATE (RPS): 30

MANUAL
SWEEP TIME (SEC): 30 75 500 1000
SWEEP WIDTH (Hz): 25 50 100 250 500
FILTER: 1 2 3 4 5 6 7 8
RF POWER LEVEL: 0.25

AUTO ☐
(250)
(500)
(2)
(.05)

SAMPLE: USP-39A Lot#4-1 REMARKS: 0.106 gm sample
SOLVENT: Unisol-d + 0.52 TMS 0.906 gm solvent
DEC. LEVEL

ORIGINAL PAGE IS
OF POOR QUALITY

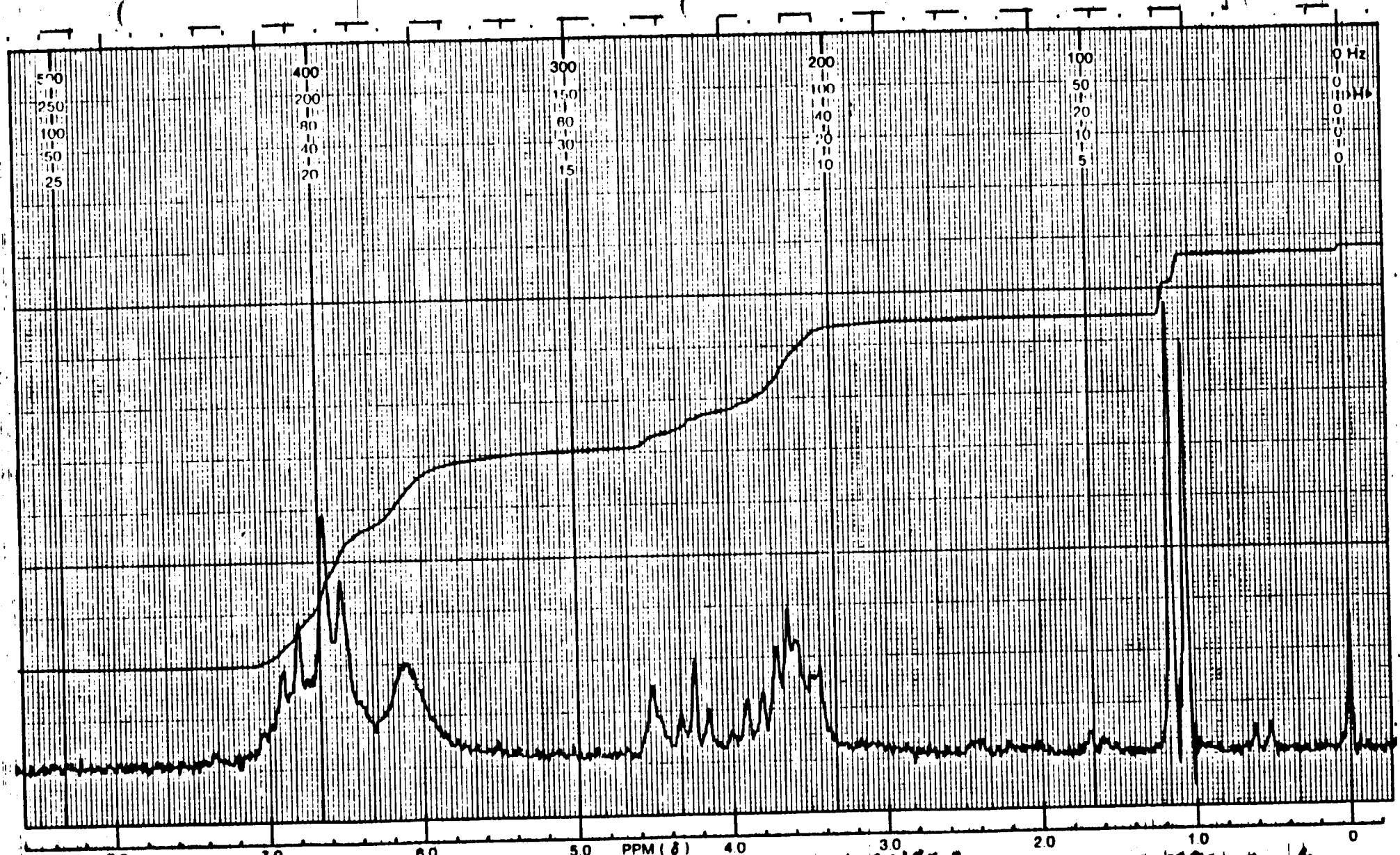
CHART 15A

NORELL, INC.
LANDISVILLE, N.J. 08326
T50 Phone: (609) 697-0020

DATE: 3-21-86

OPERATOR DFW

SPECTRUM NO. 6 of 7 USP-39A Lot#4-1



SWEEP OFFSET (Hz): 0
SPECTRUM AMPLITUDE: 8.0
INTEGRAL AMPLITUDE: 6.0
SPINNING RATE (RPS): 20

MANUAL
SWEEP TIME (SEC): 50 | 150 | 300 | 1000
SWEEP WIDTH (Hz): 25 | 50 | 100 | 250 | 500
FILTER: 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8
RF POWER LEVEL: 0.25

AUTO ☐
(250)
(500)
(2)
(.05)

SAMPLE: USP-39A Lot#4-2
SOLVENT: Uniso-d+0.52 TMS
DEC. LEVEL

REMARKS: 0.108gm sample
0.836 gm solvent

ORIGINAL PAGE IS
OF POOR QUALITY

DATE: 3-21-86
OPERATOR: DGW
SPECTRUM NO. 7 of 7 USP-39A
Lot # 4-2

CHART 15B

NORELL, INC.
LANDISVILLE, N.J. 08326
T60 Phone: (609) 697-0020

TABLE OF CONTENTS

FABRIC TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

WCA Fabric for NASA Lot# 4 (KAISER)

CHARTS

U.S. Polymeric

FABRIC TESTING

NAS8-36298

U.S. POLYMERIC O.E. 71108

WCA Fabric for NASA Lot# 4 (KAISER)

1a. Breaking Strength, lbs/in, WARP
ASTM D1682

	#4-2S	#4-2E	LOT4 AVG
PICK	31	31	31.0
CENTER	32	57	44.5
PLAIN	37	43	40.0
AVG.	33.3	43.7	38.5

1b. Breaking Strength, lbs/inch, FILL
ASTM D1682

PICK	10	14	12.0
CENTER	13	17	15.0
PLAIN	15	29	22.0
AVG.	12.7	20.0	16.3

2a. Carbon Assay, %
MDQAI 5560

PICK	99.9	99.2	99.55
CENTER	99.9	99.6	99.75
PLAIN	99.2	99.5	99.35
AVG.	99.67	99.43	99.55

2b. Hydrogen Assay, %
MDQAI 5560

PICK	<.01	<.01	EST .001
CENTER	<.01	<.01	EST .001
PLAIN	<.01	<.01	EST .001
AVG.	EST .001	EST .001	EST .001

2c. Nitrogen Assay, %
MDQAI 5560

PICK	.1	.03	.065
CENTER	.1	.10	.100
PLAIN	.1	.20	.150
AVG.	.1	.11	.105

3. Visual Inspection
QCi-102

See Charts 3A

4. Specific Gravity, Units
PTM-84

PICK	1.6099	1.6009	1.6054
CENTER	1.6355	1.6121	1.6238
PLAIN	1.6707	1.6395	1.6551
AVG.	1.639	1.618	1.628

HITCO MATERIALS DIVISION
700 E. DYER ROAD, SANTA ANA, CALIFORNIA 92707 • (714) 549-1101 • TWX (910) 595-1130 • FAX # (714) 549-2858-5-2437

WCA Fabric for NASA Lot# 4 (KAISER)

5. pH, Units
CTM-24B

	#4-2S	#4-2E	LOT4 AVG
	6.2	6.3	6.25
	6.2	6.4	6.30
AVG.	6.2	6.35	6.28

6. TGA, °C at 50% Weight Loss
CTM-51 (AIR)

SET UP# 1
#4-2E 955

SET UP# 2
#4-2S 868

See Chart 6A-6B

7a. Atomic Absorption, ppm
CTM-53B

	#4-2S	#4-2E	LOT4 AVG
Na	5	6	5.5
K	0	0	0.0
Ca	4	6	5.0
Mg	3	2	2.5
Li	0	0	0.0
AVG.	12	14	13.0

7b. Moisture Content, %
CTM-53B

#4-2S	#4-2E	LOT4 AVG
.005	.005	.005

7c. Ash Content, %
CTM-53B

#4-2S	#4-2E	LOT4 AVG
.010	.010	.010

8a. Filament diameter, microns, WARP
S.E.M. (Diameters are an average of 10 measurements)

	#4-2S	#4-2E	LOT4 AVG
AVERAGE	10.67	10.18	10.42
Minimum	9.50	8.00	8.00
Maximum	11.65	11.20	11.65
Std. Dev	0.64	1.10	0.91

9a. Thread Count, per inch, WARP
PTM-5A

	#4-2S	#4-2E	LOT4 AVG
	29	29	29
	29	29	29
	29	29	29
	29	29	29
	29	29	29
AVG.	29.0	29.0	29.0

9b. Thread Count, per inch, FILL
PTM-5A

	#4-2S	#4-2E	LOT4 AVG
	22	22	22
	22	22	22
	22	22	22
	22	22	22
	22	22	22
AVG.	22.0	22.0	22.0

WCA Fabric for NASA Lot# 4 (KAISER)

10a. Areal Weight as received, gm/4x4
PTM-3A

LEFT	2.590	2.581	2.586
CENTER	2.552	2.540	2.546
RIGHT	2.596	2.581	2.589
AVG.	2.579	2.567	2.573

10b. Volatiles as received, %
PTM-3A

LEFT	.54	.62	.58
CENTER	.51	.51	.51
RIGHT	.58	.62	.60
AVG.	.54	.58	.56

10c. Weight change on Acetone wash, %
PTM-3A

LEFT	.00	-.08	-.04
CENTER	-.16	-.24	-.20
RIGHT	.04	.00	.02
AVG.	-.04	-.11	-.07

U.S. Polymeric

Hamid M. Quraishi, Manager
Quality Assurance Department

USP NO. CHART 3A

DATE 28 APR. 86

FABRIC WCA GRAPHITE CLOTH

MFG. UNION CARBIDE

ROLL NO. 184 3C6 WCA-4

YARDS 180

POUNDS 102

ORDER NO. 7108

SPECIFICATION VARIOUS

Q.C. FILE # NASA 4-2

START Sample

LEFT

10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250

98 PULL THREAD

275 + BREAK

313 F

328 BREAK
360 BREAK
430 BREAK
510 PULL THREAD

END SAMPLE
528 - END OF ROLL

TREATER OPERATOR READ UP

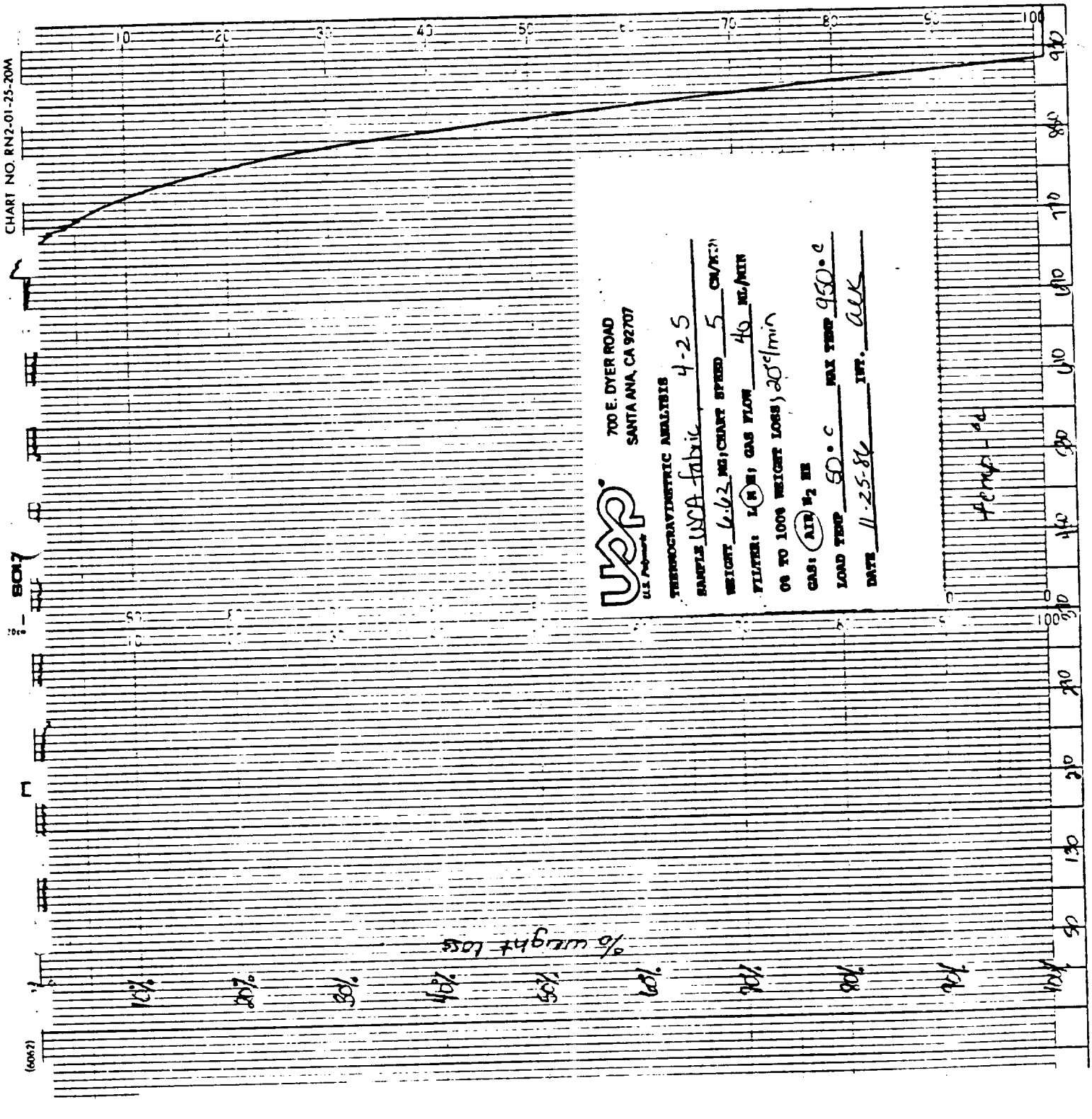
SYMBOLS

- TEAR
- SPOTS OR STAINS
- FOLDS
- EDGE CURL
- TIGHT WEAVE OR SELVAGE
- WEAVE DISTORTION
- VISIBLE PUCKERS
- ONE PUCKER CREASING
- TWO OR MORE CREASINGS

REMARKS

GRADE Grade B

ORIGINAL PAGE IS
OF POOR QUALITY



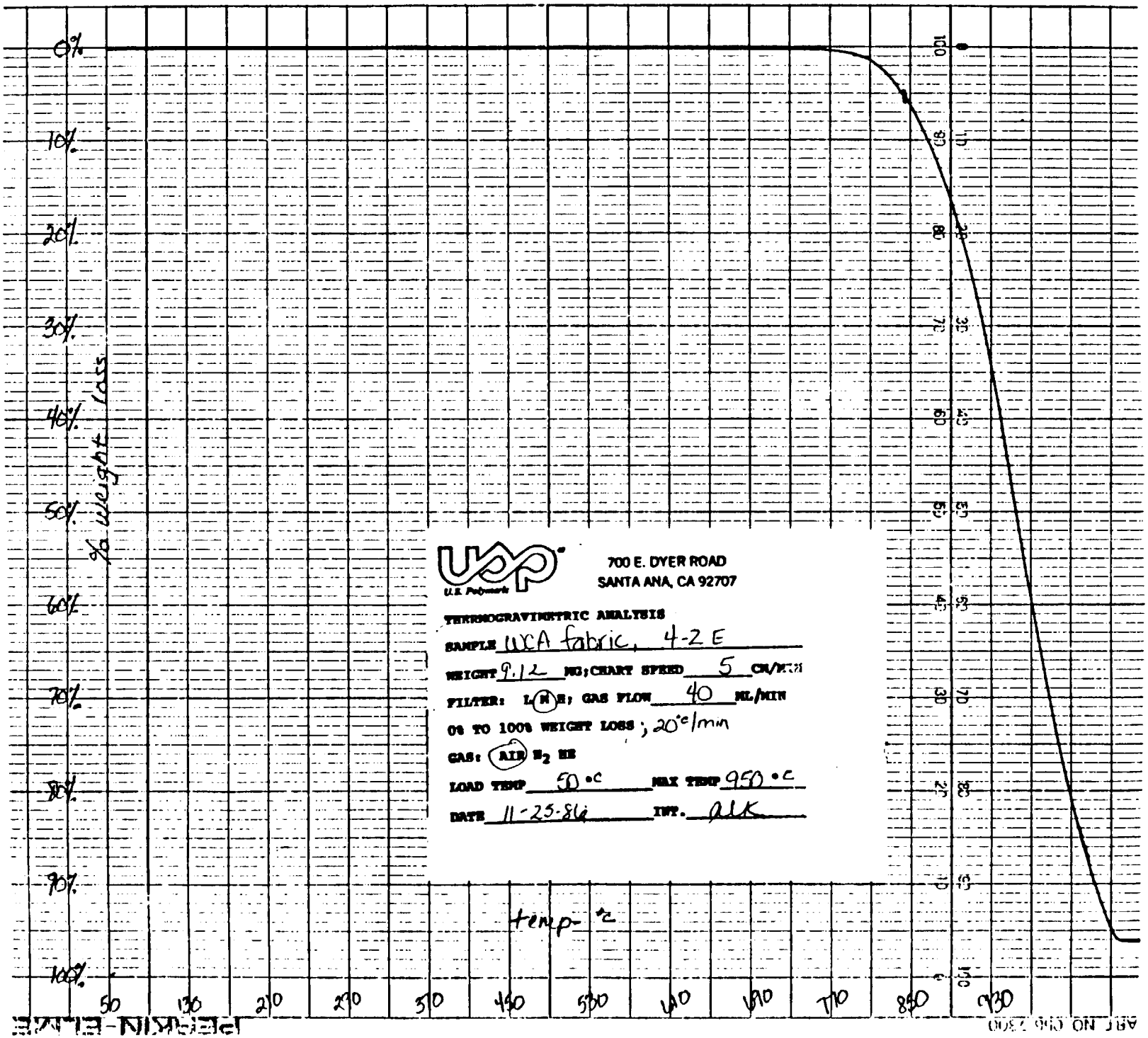


CHART 6B

TABLE OF CONTENTS

PREPREG TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

FM 5064J NASA LOT# 4 U.S.P. LOT# D09316 (KAISER)

CHARTS

U.S. Polymeric

PREPREG TESTING

NAS8-36298

U.S. POLYMERIC O.E.71108

FM 5064J NASA LOT# 4 U.S.P. LOT# D09316 (KAISER)

		ROLL#1-S	ROLL#1-E
1a. Resin Content, Soxhlet, % CTM-6D		32.6	31.6
		32.3	31.4
		32.6	31.5
	AVG.	32.5	31.5
	NASA LOT# 4 AVERAGE		32.0
1b. Filler Content, Soxhlet, % CTM-6D		14.3	13.9
		14.2	13.8
		14.3	13.8
	AVG.	14.3	13.8
	NASA LOT# 4 AVERAGE		14.1
1c. Cloth Content, Soxhlet, % CTM-6D		53.1	54.5
		53.5	54.8
		53.1	54.7
	AVG.	53.2	54.7
	NASA LOT# 4 AVERAGE		54.0
2. Volatile Content, % PTM-17B		3.0	2.7
		2.7	2.8
		2.6	2.9
	AVG.	2.8	2.8
	NASA LOT# 4 AVERAGE		2.8
3. Flow, 1000 psi, % PTM-19G		17.8	18.1
		18.1	17.4
		17.7	17.9
	AVG.	17.9	17.8
	NASA LOT# 4 AVERAGE		17.8
4. Resin Content, Dry basis, % PTM-16F, Type II		34.0	32.8
		33.1	32.2
		33.5	32.7
	AVG.	33.5	32.6
	NASA LOT# 4 AVERAGE		33.1
5. Tack, lbs PTM-80		38	42
	NASA LOT# 4 AVERAGE		40
6. Gel Time, seconds PTM-20E		78	83
	NASA LOT# 4 AVERAGE		81

HITCO MATERIALS DIVISION
700 E. DYER ROAD, SANTA ANA, CALIFORNIA 92707 • (714) 549-1101 • TWX (910) 595-1130 • FAX # (714) 549-2858-5-2437

FM 5064J NASA LOT# 4 U.S.P. LOT# D09316 (KAISER)

7a. Atomic Absorption, ppm
CTM-53B

	ROLL#1-S	ROLL#1-E	LOT#4 AVG.
Na	25	25	25
K	2	2	2
Ca	10	5	8
Mg	2	2	2
Li	0	0	0
TOTAL	39	34	37

7b. Moisture Content, %
CTM-53B

	ROLL#1-S	ROLL#1-E
	2.39	1.94
NASA LOT# 4 AVERAGE		2.17

7c. Ash Content, %
CTM-53B

	.09	.09
NASA LOT# 4 AVERAGE		.09

8. TGA, % Weight Loss at 500°C
CTM-51 (Nitrogen)

	10.7	10.7
NASA LOT# 4 AVERAGE		10.7

See chart 8A-8B

9. DSC, °C
CTM-50A

	ROLL#1-S	ROLL#1-E	LOT#4 AVG.
First Temp	185	184	185

See Chart 9A-9B

10. Infrared (IRZB) Baseline
CTM-21C

	.83	.82	.82

See Chart 10A-10B

11. Environmental History

Date manufactured: 30 June 1986
Packaged in: MIL-B-131
class I bag
Date shipped: 31 July 1986 in
40°F truck

12. Specific Gravity, Cured, Units
ASTM D792

	ROLL#1-S	ROLL#1-E
	1.426	1.432
	1.424	1.433
	1.424	1.435
AVG.	1.425	1.434
NASA LOT# 4 AVERAGE		1.429

13a. Tensile Strength, ksi, WARP
FTMS 406-1011

	19.57	19.82
	19.16	19.78
	19.49	20.05
	20.14	20.62
	19.42	19.93
AVG.	19.56	20.04
NASA LOT# 4 AVERAGE		19.80

FM 5064J NASA LOT# 4 U.S.P. LOT# D09316 (KAISER)

	ROLL#1-S	ROLL#1-E
13b. Tensile Modulus, msi, WARP FTMS 406-1011	1.93	2.00
	2.26	2.13
	2.12	2.20
	2.21	2.31
	2.14	2.10
AVG.	2.13	2.15
NASA LOT# 4 AVERAGE		2.14
13c. Tensile Elongation, %, WARP FTMS 406-1011	1.28	1.26
	1.20	1.29
	1.15	1.22
	1.15	1.34
	1.13	1.25
AVG.	1.18	1.27
NASA LOT# 4 AVERAGE		1.23
14a. Flexural Strength, ksi, WARP FTMS 406-1031	26.60	27.76
	27.19	27.81
	26.82	28.13
	28.14	28.39
	27.97	27.47
AVG.	27.34	27.91
NASA LOT# 4 AVERAGE		27.63
14b. Flexural Modulus, msi, WARP FTMS 406-1031	1.85	1.92
	1.89	1.90
	1.91	1.90
	1.92	1.93
	1.98	1.96
AVG.	1.91	1.92
NASA LOT# 4 AVERAGE		1.92
15a. Compressive Strength, ksi, WARP FTMS 406-1021	19.11	19.66
	20.94	19.37
	18.86	17.91
	18.75	18.69
	21.39	19.95
AVG.	19.81	19.12
NASA LOT# 4 AVERAGE		19.46
15b. Compressive Modulus, msi, WARP FTMS 406-1021	1.98	2.01
	2.01	2.07
	2.07	2.05
	2.03	2.10
	2.02	2.08
AVG.	2.02	2.06
NASA LOT# 4 AVERAGE		2.04

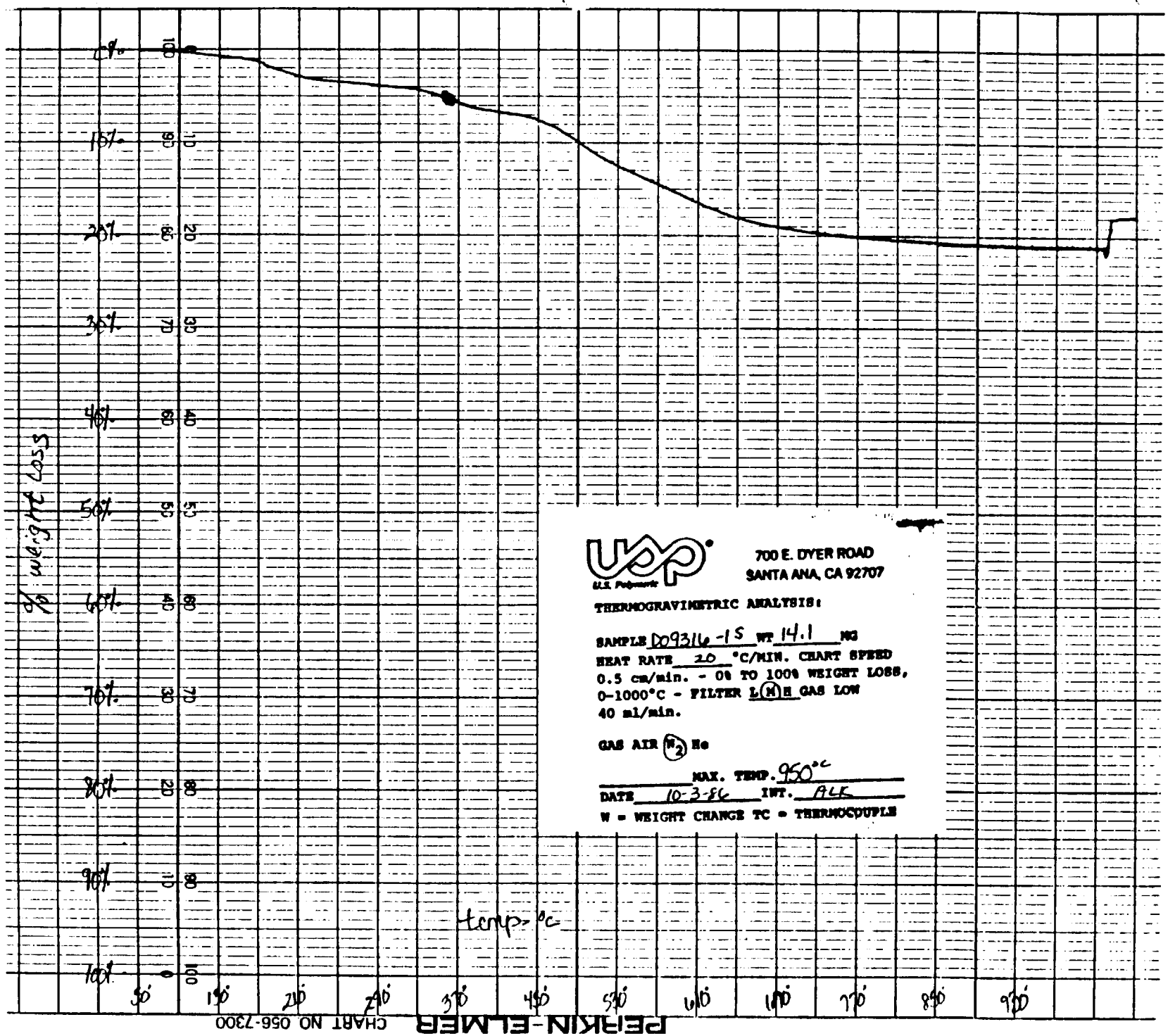
FM 5064J NASA LOT# 4 U.S.P. LOT# D09316 (KAISER)

	ROLL#1-S	ROLL#1-E
16. Double Shear Strength, ksi FTMS 406-1041A	2.41	2.37
	2.48	2.40
	2.35	2.34
	2.47	2.34
	2.29	2.23
AVG.	2.40	2.34
NASA LOT# 4 AVERAGE		2.37
17. Barcol Hardness, Units ASTM D-2583 (Average of 10 determinations)	59.2	58.0
NASA LOT# 4 AVERAGE		58.6
18. Residual Volatiles, % PTM-98	1.20	1.29
	1.20	1.09
	1.23	1.10
AVG.	1.21	1.16
NASA LOT# 4 AVERAGE		1.18
19. Resin Content, Pyrolysis, % CTM-14B	29.34	30.64
	30.17	31.67
	28.62	30.07
AVG.	29.38	30.79
NASA LOT# 4 AVERAGE		30.09
20. Acetone Extraction, % CTM-18A	5.38	6.14
	6.28	5.87
	5.12	6.48
AVG.	5.60	6.16
NASA LOT# 4 AVERAGE		5.88
21a. CTE, in/in •F with PLY PTM-61B	1.81	3.58
	2.64	1.09
AVG.	2.23	2.34
NASA LOT# 4 AVERAGE		2.28
21b. CTE, in/in •F Cross PLY PTM-61B	4.06	3.66
	2.57	5.33
AVG.	3.32	4.50
NASA LOT# 4 AVERAGE		3.91

See Chart 21A-21B

U.S. Polymeric

Hamid M. Quraishi, Manager
Quality Assurance Department



USP U.S. Polymeric

700 E. DYER ROAD
SANTA ANA, CA 92707

THERMOGRAVIMETRIC ANALYSIS:

SAMPLE D09316-1S WT 14.1 MG
HEAT RATE 20 °C/MIN. CHART SPEED
0.5 cm/min. - 0% TO 100% WEIGHT LOSS,
0-1000°C - FILTER L(M)H GAS LOW
40 ml/min.

GAS AIR (N2) He

MAX. TEMP. 950°C
DATE 10-3-86 INT. ALE
W = WEIGHT CHANGE TC = THERMOCOUPLE

CHART 8A

ORIGINAL PAGE IS
OF POOR QUALITY

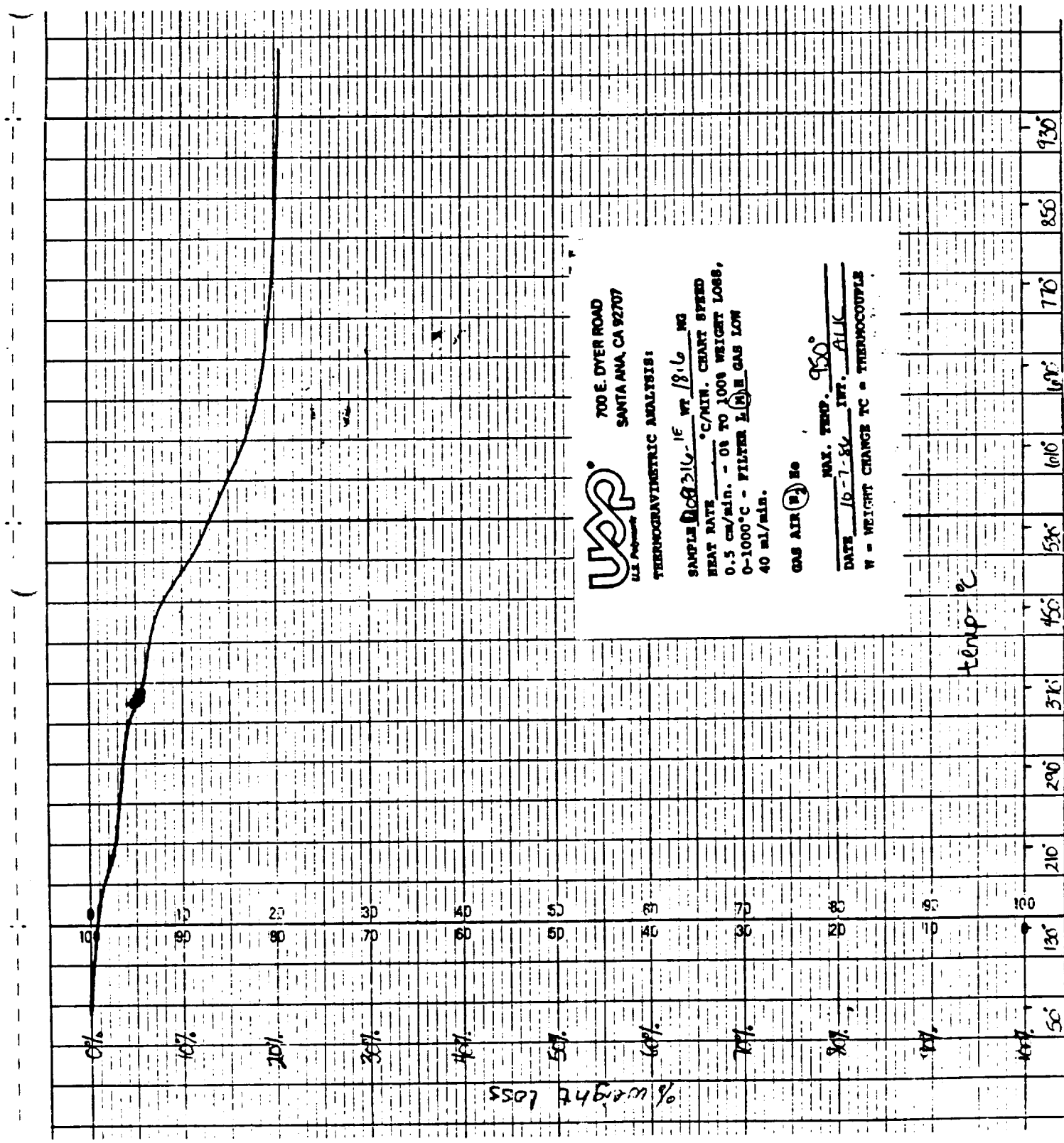


CHART 9A

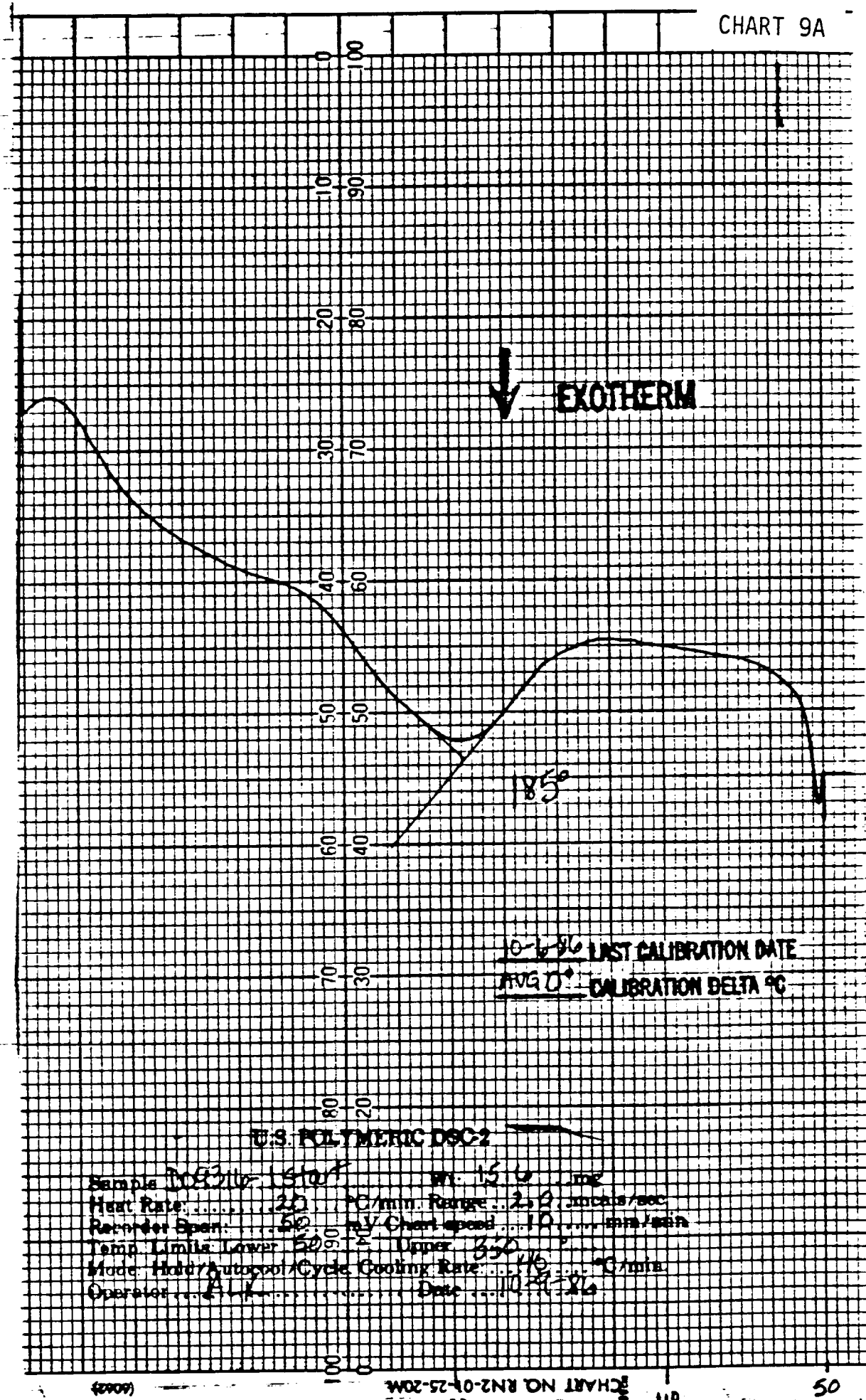
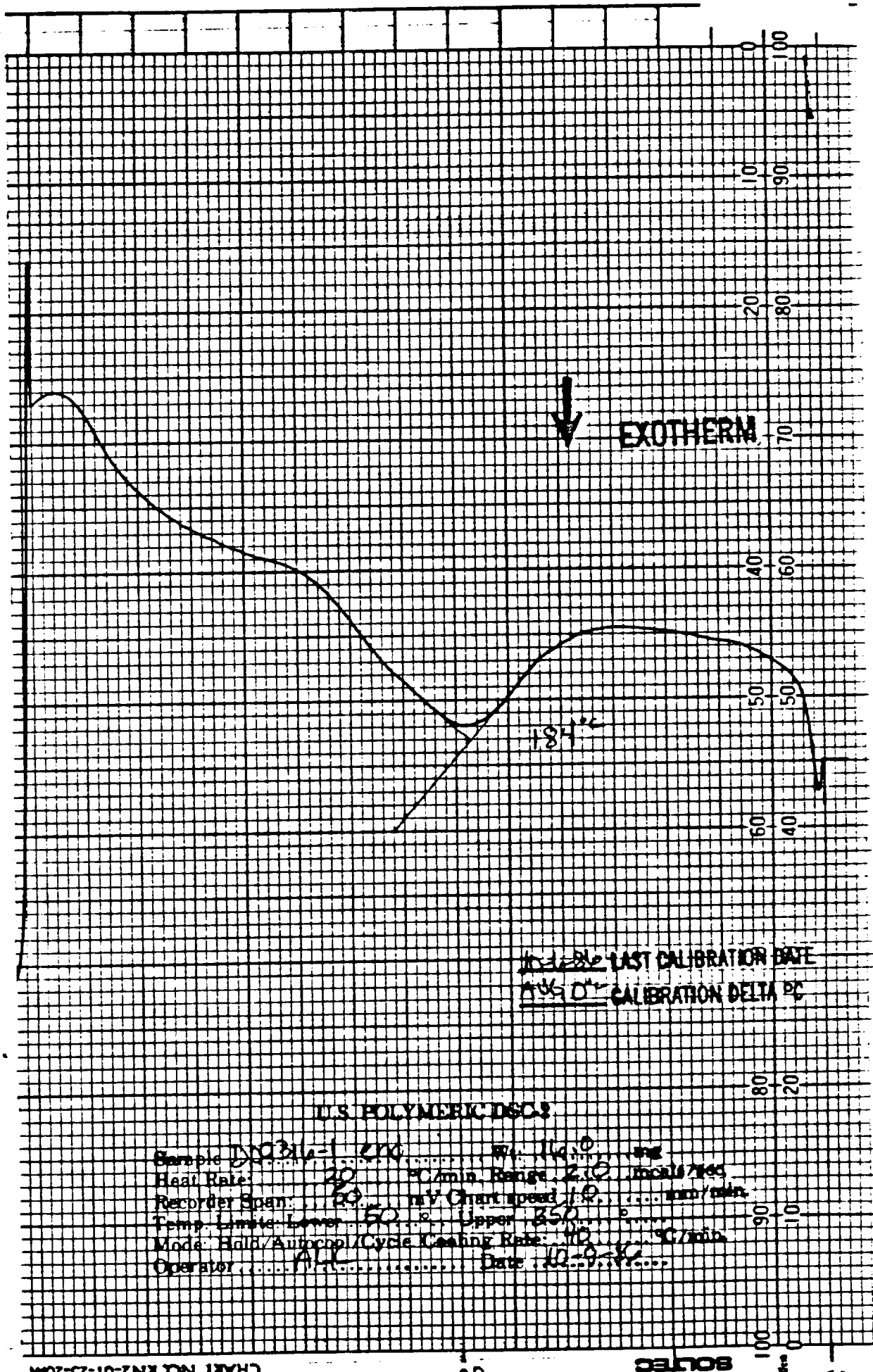


CHART 9B



ORIGINAL PAGE IS
OF POOR QUALITY

SPECTRUM NO. 15197
DATE 7-07-86
SAMPLE FM 5064-1
D09316 #5T-1
SOURCE
STRUCTURE

PATH 0.2 mm NACL
SOLVENT ACETONE
CONCENTRATION 30-50 %T
PHASE 3
COMMENTS PRE-PREG
MATERIAL
ANALYST V. MIRANDA

Beckman®
INFRARED
SPECTROPHOTOMETER

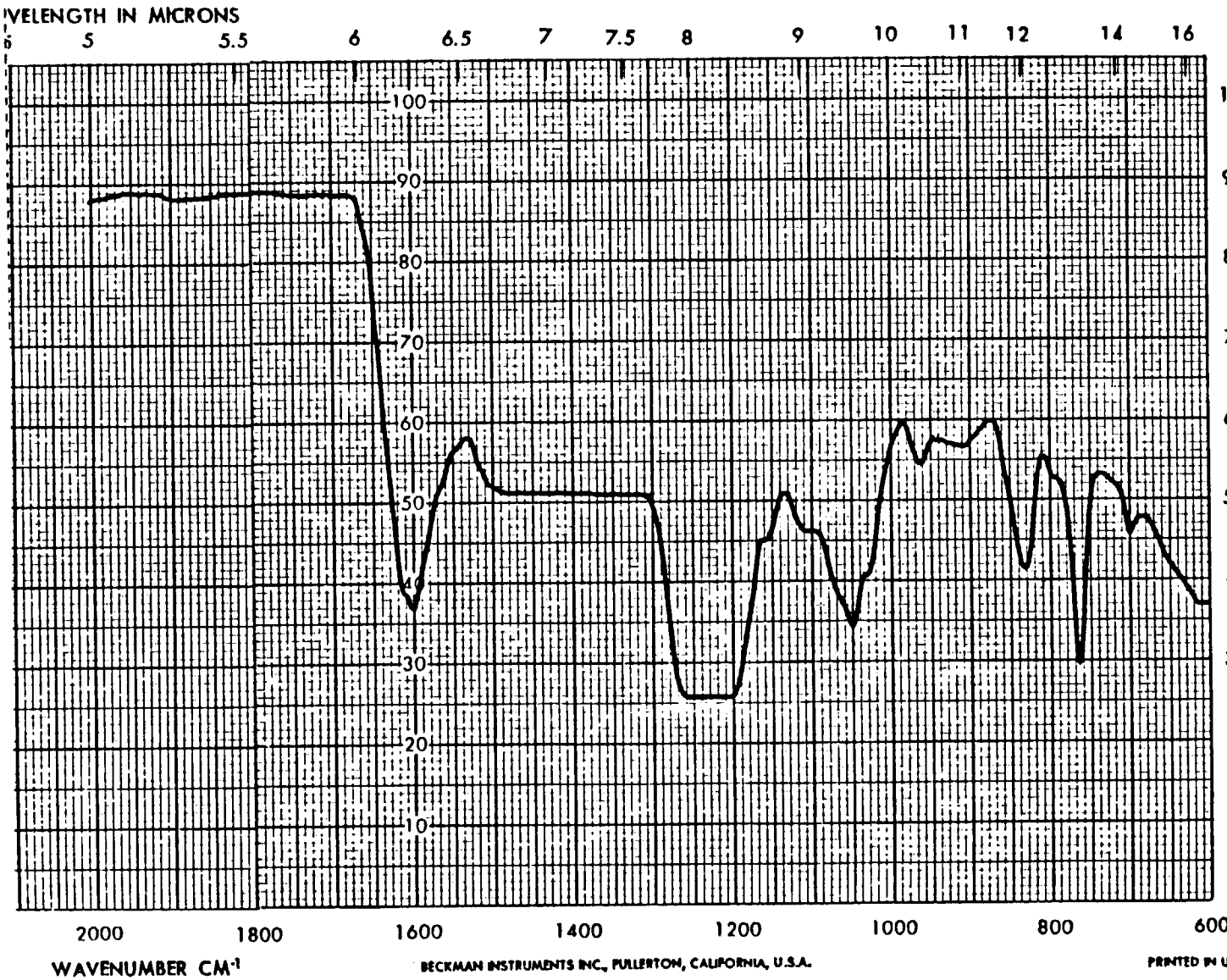


CHART 10A

SPECTRUM NO. 15198
DATE 7-07-86
SAMPLE FM 5064J
D09316 # E-1

SOURCE

STRUCTURE

PATH 0.2 mm NACL
SOLVENT ACETONE
CONCENTRATION 30-50% T
PHASE 3
COMMENTS PRE-PREG
MATERIAL

ANALYST V. MIRANDA

Beckman®
INFRARED
SPECTROPHOTOMETER

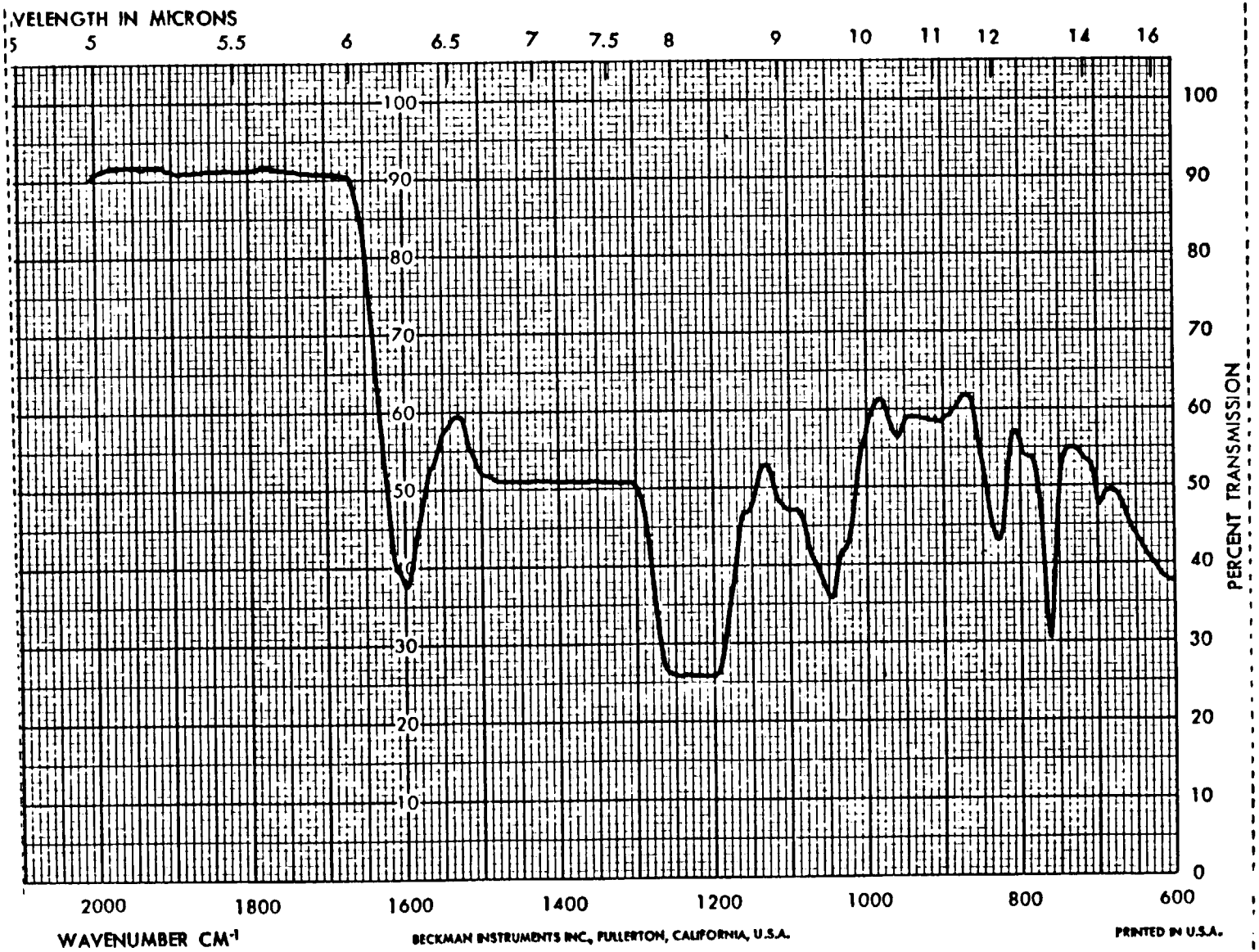


CHART 10B

ORIGINAL PAGE IS
OF POOR QUALITY

PART NO. 990088

RUN NO. ___ DATE 12/4/X OPERATOR DJ SAMPLE Dag 316 - 1-smart - (1) ATM Air @ STP FLOW RATE 3-5 SCCM W/Pig	T-AXIS SCALE, °C/in 30 20 PROG. RATE, °C/min 10 HEAT ✓ COOL ___ ISO ___ SHIFT, in 0	DTA-DSC SCALE, °C/in ___ (mcal/sec)/in ___ WEIGHT, mg ___ REFERENCE ___	TGA SCALE, mg/in ___ SUPPRESSION, mg ___ WEIGHT, mg ___ TIME CONST., sec ___ dY, (mg/min) /in ___	TMA (Quartz) SCALE, mils/in 0.1/0.2 MODE Expansion SAMPLE SIZE 0.256 LOAD, g 10 dY, (10X), (mils/min)/in ___	___ ___ ___ ___ ___ ___

$\frac{\Delta L}{L_0} = \frac{16.00 (10^{-3})}{0.256 (20)} = 11.6\%$

DUPONT Instruments

MEASURED VARIABLE

Chart 21A1

PART NO. 990088

RUN NO. ___ DATE 12/4/96 OPERATOR TDA SAMPLE: DOS 3/6-1-3/MIT-(2) ATM Air @ STP FLOW RATE 3.5 SCCM cupy	T-AXIS SCALE, °C/in 50 20 PROG. RATE, °C/min 10 HEAT ✓ COOL ___ ISO ___ SHIFT, in 0	DTA-DSC SCALE, °C/in ___ (mcal/sec)/in ___ WEIGHT, mg ___ REFERENCE ___	TGA SCALE, mg/in ___ SUPPRESSION, mg ___ WEIGHT, mg ___ TIME CONST., sec ___ dY, (mg/min) /in ___	TMA (mil/min) SCALE, mils/in 0.5/0.2 MODE Expansion SAMPLE SIZE 0.263 LOAD, g 20 dY, (10X), (mils/min)/in ___	

$\frac{dL}{L_0 dT} = \frac{3(0.0001)}{0.263 \; 2.5(8)118} = 0.647$

MEASURED VARIABLE ___

DUPONT Instruments

Chart 21A2

ORIGINAL PAGE IS
OF POOR QUALITY

PART NO. 990068

RUN NO ___ DATE 12/4/96 OPERATOR DJ SAMPLE: D0316-1-Smer.(3) ATM Air @ STP FLOW RATE 2-55ccm	T-AXIS SCALE, °C/in 50 20 PROG. RATE, °C/min 10 HEAT ✓ COOL ___ ISO ___ SHIFT, in 0	DTA-DSC SCALE, °C/in ___ (mcal/sec)/in ___ WEIGHT, mg ___ REFERENCE ___	TGA SCALE, mg/in ___ SUPPRESSION, mg ___ WEIGHT, mg ___ TIME CONST, sec ___ dY, (mg/min)/in ___	TMA (mils/inch) SCALE, mils/in 0.1/0.2 MODE Expansion SAMPLE SIZE 0.137 LOAD, g 10 dY, (10X), (mils/min)/in ___	___ ___ ___ ___ ___ ___

MEASURED VARIABLE

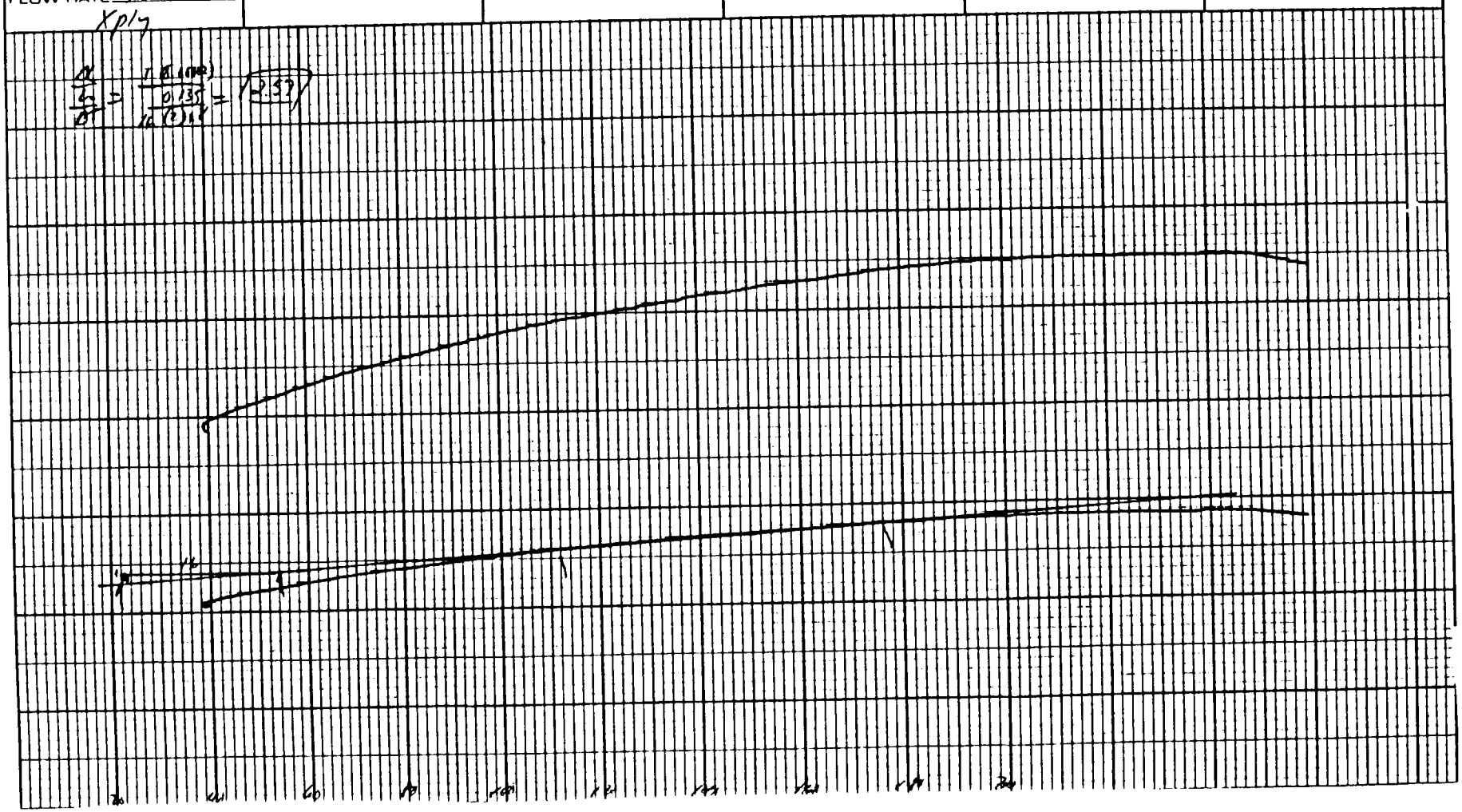
DU PONT Instruments

Chart 21A3

ORIGINAL PAGE IS
OF POOR QUALITY

PART NO. 990088

RUN NO. ___ DATE 12/4/96	T-AXIS	DTA-DSC	TGA	TMA (5 cm/min)	
OPERATOR TJ	SCALE, °C/in 50 20	SCALE, °C/in	SCALE, mg/in	SCALE, mils/in 0.1/0.2	
SAMPLE: D09316-1-3mm-(H)	PROG. RATE, °C/min 10	(mcal/sec)/in	SUPPRESSION, mg	MODE Expansion	
ATM Air @ STP	HEAT / COOL ___ ISO ___	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE 0.135	
FLOW RATE 3.55(1)	SHIFT, in 0	REFERENCE	TIME CONST., sec	LOAD, g 10	
Xply			dY, (mg/min) /in	dY, (10X), (mils/min)/in	



DUPONT Instruments

MEASURED VARIABLE

Chart 21A4

ORIGINAL PAGE IS
OF POOR QUALITY

PART NO. 990088

RUN NO ___ DATE 12/4/92 OPERATOR JH SAMPLE: Dog 316-1-END-(1) ATM N_2 @ STP FLOW RATE 2.5 SCFH W/P 1	T-AXIS SCALE, °C/in 50 20 PROG. RATE, °C/min 10 HEAT ✓ COOL ___ ISO ___ SHIFT, in 0	DTA-DSC SCALE, °C/in ___ (mcal/sec)/in ___ WEIGHT, mg ___ REFERENCE ___	TGA SCALE, mg/in ___ SUPPRESSION, mg ___ WEIGHT, mg ___ TIME CONST., sec ___ dY, (mg/min)/in ___	TMA (mils/mil F) SCALE, mils/in 0.1/0.2 MODE Expansion SAMPLE SIZE 0.259 LOAD, g 10 dY, (10X), (mils/min)/in ___	

$\frac{dY}{dt} \div \frac{dY}{dT} = \frac{\frac{9\,(\text{g-mole})}{1.259}}{24\,(\text{F})\,1.4} = 1358$

MEASURED VARIABLE

DUPONT Instruments

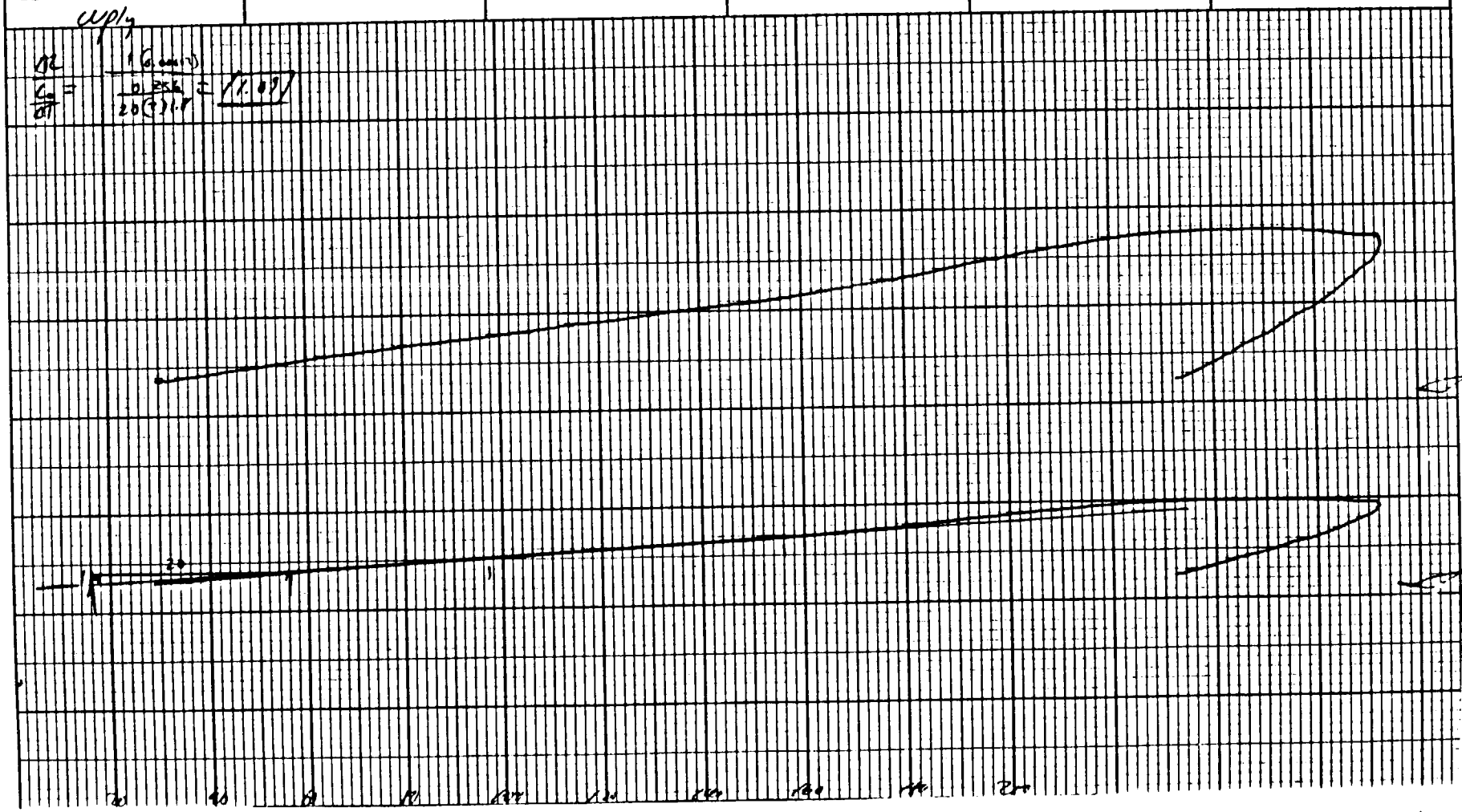
Chart 21B1

PART NO. 990068

RUN NO. ___ DATE 12/4/96	T-AXIS	DTA-DSC	TGA	TMA (5 min/inch)	
OPERATOR DJ	SCALE, °C/in 50 20	SCALE, °C/in	SCALE, mg/in	SCALE, mils/in 0.1/0.2	
SAMPLE	PROG. RATE, °C/min 10	(mcal/sec)/in	SUPPRESSION, mg	MODE Expansion	
D6316-1-6,D (2)	HEAT ✓ COOL ___ ISO ___	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE 0.25	
ATM Air @ STP	SHIFT, in 0	REFERENCE	TIME CONST., sec	LOAD, g 10	
FLOW RATE 3.5 SCFH			dY, (mg/min)/in	dY, (10X), (mils/min)/in	

wpl

$\frac{12}{6.01} = \frac{1\ \text{(Gram)}}{\frac{0.25}{20}(3)1.4} = 11.9$



DUPONT Instruments

MEASURED VARIABLE

Chart 21B2

PART NO. 990088

RUN NO. ___ DATE 12/4/86	T-AXIS	DTA-DSC	TGA	TMA (mm/min)	
OPERATOR DJ	SCALE, °C/in 50 20	SCALE, °C/in	SCALE, mg/in	SCALE, mils/in 0.1/0.2	
SAMPLE: DOS316-1-FM-(3)	PROG. RATE, °C/min 10	(mcal/sec)/in	SUPPRESSION, mg	MODE EXPANSN	
ATM Air @ STP	HEAT ✓ COOL ___ ISO ___	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE 0.13	
FLOW RATE 3-3.5 CFH	SHIFT, in 0	REFERENCE	TIME CONST., sec	LOAD, g 10	
Xply			dY, (mg/min) /in	dY, (10X), (mils/min)/in	

$\frac{dX}{dT} = \frac{1\text{"}(6\text{ chart})}{0.158} = 13.66$

MEASURED VARIABLE

DUPONT Instruments

Chart 21B3

ORIGINAL PAGE IS
OF POOR QUALITY

Chart 21B4

PART NO. 990088

RUN NO. ___ DATE 12/4/86
OPERATOR PJ
SAMPLE
D0936-1-GD (4)
ATM Air @ STP
FLOW RATE 1.5 (cc)
Xp/y

T-AXIS
SCALE, °C/in 30 20
PROG RATE, °C/min 10
HEAT ✓ COOL ___ ISO ___
SHIFT, in 0

DTA-DSC
SCALE, °C/in ___
(mcal/sec)/in ___
WEIGHT, mg ___
REFERENCE ___

TGA
SCALE, mg/in ___
SUPPRESSION, mg ___
WEIGHT, mg ___
TIME CONST., sec ___
dY, (mg/min)/in ___

TMA (mm/cm)
SCALE, mils/in 0.1/0.2
MODE Expansion
SAMPLE SIZE 0.139
LOAD, g 10
dY, (10X) (mils/min)/in ___

dL = 1.6444 (0.139) = 0.33
dT 3(2) Y

0.1
0.2

MEASURED VARIABLE

DUPONT instruments